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General Articles

INFECTIOUS LARYNGO-TRACHEITIS IN POULTRY

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Synonyms. — Infectious tracheo-laryngitis, infectious tracheitis (trachitis), infectious bronchitis, contagious bronchitis, Canadian "flu," or simply "flu."

Historical.—The disease has existed in the United States of America for many years. Beaudette states that he saw the disease in a fattening plant in Manhattan, Kansas, in 1920. Then and on the occasion of another outbreak in the same plant the following year, the causal organism of fowl cholera was isolated from some of the birds and an erroneous interpretation as to the cause of death was given. Similarly on some occasions the virus of fowl pox has been recovered from typically affected birds and again caused an error in diagnosis. Many workers noted the presence of the disease in the United States of America and Canada in the following years.

In 1930, Beaudette and Hudson reported the cause of the disease to be a filtrable virus. This finding was confirmed almost immediately by Beach, Graham, Thorp and James, and Gibbs.

In 1931, Hinshaw published a survey of the incidence of the disease and stated that it had been reported at that time in almost every State. It is commonly seen on both the East and West coasts and in the fattening plants in the middle West.

The disease is frequently found in Canada, and Seifried reports that in recent years it has been recognised in less severe infectious outbreaks in Germany and Holland.

There appear to be no records of this disease having been diagnosed in other countries.

First Proved Occurrence in Great Britain.—On January 24th, 1935, the carcase of a bird was received from a fattening plant in Norfolk.

Examination of the carcase showed a general congestion of the venous system. Mucus and diphtheritic material were found in the mouth and trachea. Cultures were made from the heart blood and bone marrow with negative results. A suspension was prepared of mucus and diphtheritic material collected from the trachea, and inoculated intravenously into a fowl and applied also to the scarified comb. The fowl remained healthy. Examination of the bird received on January 24th, with the negative cultural examination and animal inoculation, failed to explain the lesions in the trachea and general congestion and therefore the owner was requested to send more infected birds.

A carcase arrived on January 29th and *post-mortem* examination of this bird revealed marked lesions in the trachea. Acute inflammation of the mucous membrane of the trachea, with a large amount of hæmorrhage, mucus and diphtheritic material, with some necrotic masses were found. The right auricle was dilated and petechial hæmorrhages were present on the coronary groove. The liver showed an acute venous congestion. Material was collected from the trachea and inoculated intratracheally into four adult birds and six pullets about eight weeks old. All the inoculated birds became infected and after showing typical symptoms the *post-mortem* examination revealed the following macroscopic lesions in the trachea.

The mucous membrane was congested in some birds; others showed areas of hæmorrhage and large clots of blood or blood-stained mucus. In some of the tracheæ there was little blood but a diphtheritic deposit, or white to pale yellow caseous masses loosely attached to the mucous membrane. Caseous material was frequently seen loosely attached to the posterior surface of the glottis and in many cases completely occluding the lumen.

A rabbit was inoculated subcutaneously with an emulsion of bone marrow from the original infected fowl and remained healthy.

Immediately after the *post-mortem* examination had been carried out on this bird, a visit was paid to the farm to investigate the conditions there.

History of Outbreak of the Disease on the Farm from the Owner.—The farmer, a poultry fattener with about 40 years' experience of the industry, and killing about 100,000 birds per annum, stated that in October, 1934, he noticed the symptoms of a disease with which he was not familiar.

When the disease was first noticed the fattening yard contained about 5,000 birds. Many of the birds died but no steps were taken to ascertain the cause of the losses. A routine procedure

was adopted of killing the birds on the first appearance of the symptoms and dressing them. The symptoms noted were coughing, a rattle in the throat, choking, and sudden death of many of the affected. The owner estimates that during this period of about eight weeks over 6,000 birds were affected out of a total of 18-20,000.

When the carcases were dressed there was no evidence of fever, but the carcases had not the best appearance in condition or bloom and had to be sold accordingly not as first quality.

No attempt was made during this period at the isolation of affected birds or the cleansing and disinfection of the coops.

When the Christmas trade was over the number of birds on the premises was much reduced and the coops were lime washed but not scrubbed and cleaned before the lime wash was applied.

The owner had no knowledge exactly when the disease was brought on to his premises, as few records are kept and birds arrived daily from farms and markets. He was, however, of the opinion that he had seen birds on sale in a market exhibiting the same symptoms as his home stock.

The farmer consulted the County Poultry Instructor about the condition and was advised to send a bird to a Laboratory for the diagnosis to be made.

Investigation of Outbreak.—The fattening plant consisted of a yard, open to the sky, in which were arranged avenues of wooden coops with a bird capacity of about 5,000, each coop housing six to eight birds.

At the time of my visit there were about 700 birds in the coops and from these 30 were selected showing symptoms of the disease under investigation.

The following symptoms were noted in the affected birds on the farm:—

Watering of the eyes, with a frothy appearance.

A watery discharge from the nostrils.

Wheezing, gurgling or rattling in the throat.

Coughing and sneezing.

Breathing through the half opened beak with a stretching of the neck during inspiration.

Blood and blood-stained mucus on all parts of the coops.

Swollen infraorbital sinuses in two birds.

The examination of living birds showed inflammation of the mucous membrane of the glottis and trachea, with white or pale yellow particles loosely attached to these parts.

Whilst these 30 birds were all either breathing through the opened beak or coughing, many of them were not greatly distressed between the spasms of coughing, but as was found later, these birds were mostly in the early stages of the disease.

Many of the coops in the fattening yard which were unoccupied at the time of the visit, had previously housed infected birds. The coops had been treated with lime wash, but no attempt had been made to cleanse them. Under the lime wash clots of blood and blood-stained mucus were visible.

The purchased birds were transported from the infected farm to the laboratory by road and 28 arrived alive. These were divided into groups and placed in contact with other birds on February 2nd, 1935 as follows:—

1. Five affected birds were placed in contact with five birds immune to fowl pox. All the contact birds became affected and one died on February 8th, 1935. The donor birds were all sick and two died on February 5th, 1935. The remainder of the donors and contacts eventually recovered.

2. Five affected birds were placed in contact with five birds immune to Newcastle disease. All the contacts became affected, three very severely, one died and it was a long period before the remaining two severely sick birds commenced to recover. Three of the donor birds died and eventually two recovered.

3. Five affected birds were placed in contact with ten healthy fowls. All the contact birds became affected and showed typical symptoms by the 9th and four died. Four of the donors died all within five days of the commencement of the experiment.

4. Five affected birds were placed in contact with five healthy hens and five healthy ducks. All the hens became affected and three died. The ducks showed no symptoms and *post-mortem* examination gave negative results. Three of the donors died.

5. Five affected birds were placed in contact with five turkeys. Only one donor fowl died and the turkeys remained healthy with the exception of one bird which was sick but did not show typical symptoms of this disease.

Material was collected from the tracheæ of the dead birds received from the original outbreak and inoculated intratracheally into healthy birds. Typical symptoms were seen in these birds similar to those noted in the naturally affected cases on the farm, and *post-mortem* examination revealed lesions in the trachea. No macroscopic lesions were found in any other organs.

Filtrates were prepared of tracheal material using Berkefeld "V" and "N" filters and 1 c.c. inoculated intratracheally into susceptible

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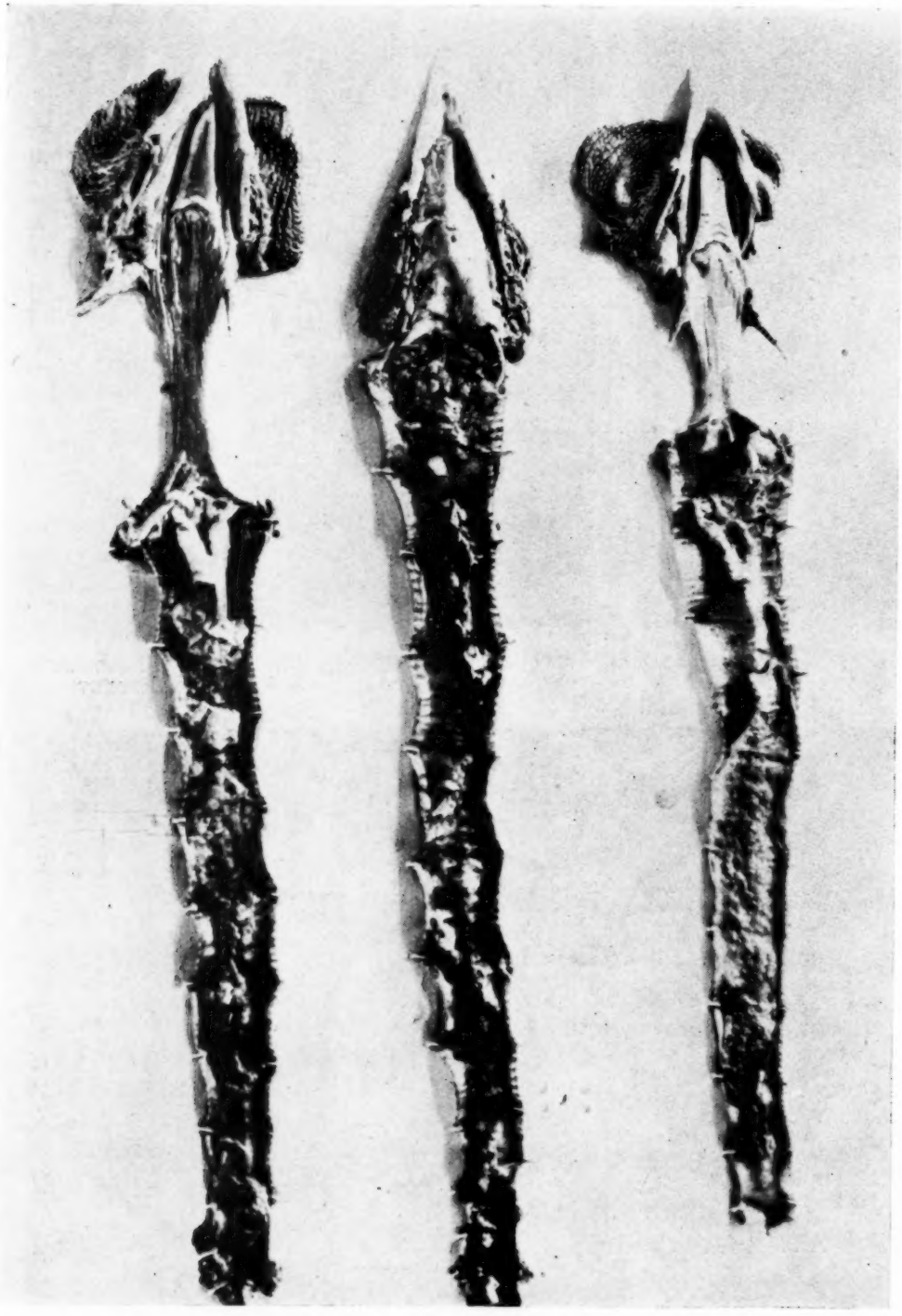
Early Symptoms of the Disease showing Breathing Through the Mouth

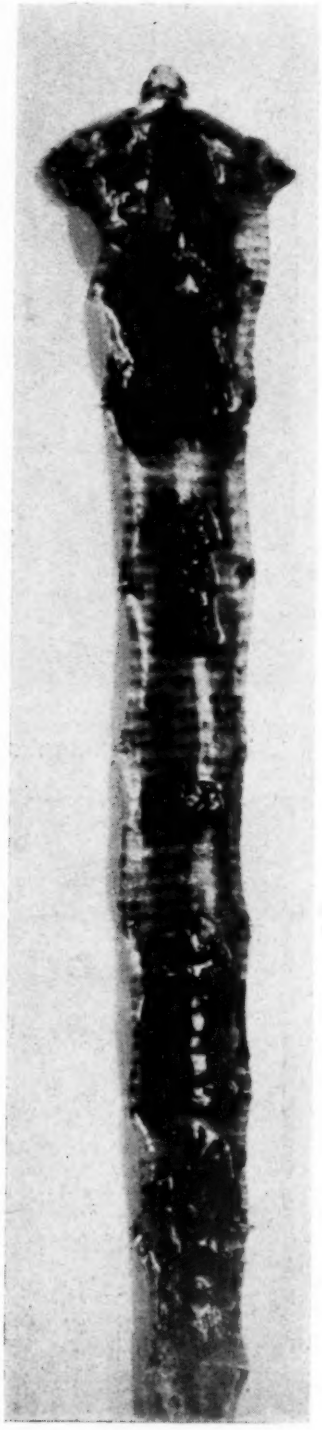
Affected Bird showing the Watery Discharge from the Eye with a Bubbling Effect

Bird in Advanced Stage of the Infection, Breathing Through the Mouth, and Extending Neck during Inspiration, Eye Closed and Discharge from the Eye

INFECTIOUS LARYNGO-TRACHEITIS IN POULTRY



Tracheæ of Affected Birds showing the Typical Lesions; Diphtheritic Deposits and Blood Clots



Trachea showing Large Clots of Blood

birds. The symptoms following inoculation were coughing, breathing through the mouth, rattling, gurgling and expectoration of blood. *Post-mortem* examination of these inoculated birds showed the typical lesions in the trachea. Many of these birds died on the fifth day following inoculation.

Dried virus received from the United States of America was used for cross-immunity tests. Birds which were brought from the initial out-

break and had recovered, were inoculated intratracheally with the American virus with entirely negative results. Controls were of course used for this test, and the healthy birds inoculated with the American strain showed symptoms and lesions as recorded for the disease under investigation. Further, birds which had recovered from the disease following inoculation with the American virus were reinoculated with the material from the Norfolk farm with negative results, whereas normal healthy fowls acting as controls gave the typical symptoms and *post-mortem* examination revealed the lesions in the trachea associated with this disease.

During the course of these experiments many of the inoculated birds have been housed in metal coops; in loose boxes measuring 16 feet by 16 feet. During the whole period healthy uninoculated birds have been housed in metal coops to test the possibility of air-borne transmission. No case has yet been recorded of any of these birds showing symptoms of the disease whilst under this experiment and when inoculated intratracheally with material from infected birds have all exhibited the usual symptoms and lesions, showing the absence of any immunity.

A large amount of cultural work has been carried out throughout the experiments, with negative results. Uncleaned coops which have housed infected birds for 14 to 24 hours after breathing symptoms have occurred, have been used in experiments. The infected bird or birds have been removed and replaced by healthy birds. Infection has been obtained by this method of coop contact. The birds placed in these dirty coops have shown the typical symptoms of the disease and some have died. *Post-mortem* examination of these birds has revealed the classical lesions in the trachea associated with the disease.

Summary and Conclusions

(1) The disease does not appear to be caused by a visible organism; all the cultural work has been negative.

(2) The filtrate obtained by using Berkefeld "V" and "N" filters when inoculated intratracheally into healthy birds reproduces the symptoms and lesions seen in the naturally-affected birds.

(3) Susceptible birds can be easily infected by the intratracheal inoculation of material collected from the trachea of infected birds. The classical symptoms associated with this disease may be noticed in three days after inoculation, followed by death two or three days later.

(4) Coop infection has been successful. The infected birds have been removed from coops after exhibiting symptoms of the disease during a period of about 14 hours, and replaced by healthy birds. Some of these healthy birds have become typically affected and died. *Post-mortem* examination has revealed the lesions in the trachea.

(5) Infection has been readily obtained by the contact of infected and susceptible birds in the same coop.

(6) Infection by contact of affected birds with those solidly immune to fowl pox has occurred, which shows the infection is not caused by the fowl pox virus.

(7) Infection by contact of affected birds with birds immune to Newcastle disease has occurred, which shows the infection is not caused by the virus of Newcastle disease.

(8) Birds which had recovered from this disease when inoculated intratracheally with an American strain of infectious laryngo-tracheitis virus showed no symptoms or lesions. Also birds which had recovered from infectious laryngo-tracheitis caused by the American virus, when inoculated with material from the initial outbreak here, were not affected; neither symptoms nor lesions were noted. In both experiments controls were arranged and at *post-mortem* examination exhibited typical symptoms and lesions of infectious laryngo-tracheitis.

It has therefore been shown that the outbreak of disease which occurred originally in Norfolk is immunologically indistinguishable from infectious laryngo-tracheitis, as known in the United States of America, represented by the virus supplied by Beaudette. At a later date, these experiments will be reported in greater detail.

[For details regarding the species affected, causal agent, incubation period, symptoms, *post-mortem* findings, carriers, methods of spread of the infection, treatment and recommendations regarding the control of the disease, readers are referred to my original article in this journal, 1935, No. 27, Vol. xv, 774-775.]

Acknowledgments

We are greatly indebted to Dr. F. R. Beaudette, New Jersey Agricultural Experiment Station, New Brunswick, New Jersey, U.S.A., for kindly supplying the virus, in order that the cross-immunity tests could be carried out to ensure the true identity of the virus encountered in this country. I am also indebted to my colleague, Mr. R. F. Gordon, B.Sc., M.R.C.V.S., for valuable co-operation when the original birds were sent in for diagnosis, and to Mr. A. Norman, Chief Laboratory Assistant, for the excellent photographs.

The depressed state of the cattle trade in Great Britain and Northern Ireland has been engaging attention and, as a result, an organisation to be known as the Livestock and Meat Industry Advisory Council of Great Britain and Northern Ireland is being formed.

Livestock of New Zealand, with special reference to Disease, Past and Present*

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In choosing this title for my address to you I have done so with several distinct purposes in view. Firstly, I wish to record some of the historical facts connected with the introduction into New Zealand of livestock and the diseases thereof, thus supplementing Dr. Robertson's Presidential Address to this Section in 1932. Secondly, in these days of aerial transport, it would seem necessary to keep the veterinary profession of adjacent countries advised on the question of diseases which occur within our Dominion, the more so perhaps to emphasise that New Zealand stock have nothing transmissible to which the stock-owners of Australia have not already become accustomed, and with which the Australian veterinarian is not conversant. Thirdly, I would wish to bring to your notice a country in which you have not the privilege of living but which certain of us consider to be second to none.

Historical References

Previous to European discovery and settlement, the only mammals known in New Zealand were two species of dog, a rat, and two species of bat.

One small *dog* with erect ears was brought for hunting purposes by the Morioris, the first natives to take possession of New Zealand. The second species was a larger, long-haired, lop-eared animal used for food and clothing and brought to New Zealand by the Maori. These dogs later crossed with European types of dogs and were unrecognisable after 1896.

The *rat* was small and brown and fed on berries. The Maoris, who introduced it, used the animal for food, and oil also was obtained from the carcase. The species is now extinct, being last seen 40 years ago.

This absence of animal food other than fish may to some extent be an explanation of the cannibalistic habits of the warlike Maori who is now so thoroughly civilised that there is no record for many years past of his having attempted to eat human flesh.

With such a virgin field, food in plenty, suitable climate, and no enemies other than man, it is not to be wondered at that domestic animals when introduced found New Zealand a paradise in which to multiply.

Historical reference to introduction of livestock and to diseases of the domestic animals introduced is somewhat scanty, but it can nevertheless be obtained from detailed histories of the early period of New Zealand settlement. New South Wales was already a settled colony before New Zealand was generally known as a desirable place in which to live. Certainly whalers were in the habit of visiting the South early in the nineteenth century, and they built rendering-down stations for oil of whales and sea lions. Those old-time intrepid explorers dealt also in seal skins and procured very valuable cargoes before the first missionaries ventured to the warmer North. Not only did the whalers take oil from fish in New Zealand waters, but they coasted along the shores and picked up adventurous Maoris, whom they introduced to Great Britain and to Australia. The intelligence of the Maori induced several responsible people to take an interest in the country, and none more so than King, Governor first of all of Norfolk Island and later of New South Wales, and his friend, the Rev. Samuel Marsden, a Methodist missionary residing in New South Wales.

It is to Captain Cook, however, that credit is due for introducing domestic stock, though the stock was not of a very high standard. In his first voyage in 1769 he presented two pigs to a Doubtless Bay chief. On his second voyage in 1773, he liberated one boar and two sows and a pair of goats at Queen Charlotte Sound. The stock liberated on these two voyages were poisoned by eating tutu, or were possibly eaten by the natives. In his second voyage Cook also brought merino sheep from the Cape of Good Hope. These sheep all died on the voyage except one which, when landed, died from tutu poisoning. On the third voyage in 1778, Captain Cook presented a boar and sow, and two goats and a kid, with some poultry to the natives of Queen Charlotte Sound with instruction to look after and breed from them. The progeny of this shipment escaped, and the northern end of the South Island of New Zealand became overrun with goats and pigs, so much so that years later steps had to be taken to kill out many of the descendants. The first stock, therefore, apart from the food value of the pig to the Maori, was of little economic importance, and later became a menace to the forest just as in later years did the introduced deer.

From the time of Cook until orderly settlement commenced in the forties, there are a few interesting references to introduction of stock. In 1793, Governor King of Norfolk Island, gave two boars and ten sows to the natives of the Bay of Islands in the far North. These unfortunate pigs are said to have been ridden up and down the beach by the Maoris in mistake for horses, with the result that two were ridden to death. A number escaped into the bush, and pigs soon spread throughout the North Island. Actually it is only the South Island pig which can be referred to as a "Captain Cooker." Again in 1800, King, as Governor of New South Wales, commanded the Norfolk Island authorities to send stock at intervals to New Zealand. They sent mainly pigs and goats to the natives in the Bay of Islands. King took considerable interest in New Zealand, realising that the country was of great potential value, since valuable cargoes of oil and wood were being obtained by whalers visiting its shores. Those Maoris leaving their home country for adventure were so unsophisticated, so happy natured, and yet so manly in character that they interested not only King but the Reverend Samuel Marsden. With the permission of the New South Wales Governor, Marsden finally sailed for New Zealand in 1814, after having become very friendly with certain Maoris in the North Auckland district. He set up a missionary station at the Bay of Islands, and had the foresight to bring with him from Governor Macquarie a horse, two mares, a few sheep, cattle, cats and dogs, turkeys, geese and fowls. The first calf was born in New Zealand from his stock at Koro-Koro in January, 1815. In 1820 Marsden imported four merino ewes

* Presidential Address to Section L—Veterinary Science—of the Melbourne (1935) Meeting of the Australian and New Zealand Association for the Advancement of Science.

and a ram as a present from King, and, after this, importation from Australia became quite common. By 1823 Marsden's herd of cows numbered 50, and formed the nucleus of dairy cows with which he intended to stock further missionary stations in New Zealand. It was also in 1823 that the first ploughing was undertaken by the Rev. John Butler by means of an imported plough and six imported bullocks.

After this time stock must have been imported and landed at several parts of the New Zealand coast, for by 1833 wild cattle were known at Pelorus Sound and on Kapiti Island—one of the native strongholds. Darwin, on his visit in 1835, saw many pigs, cattle, sheep and poultry, and records seeing even a forge. John Jones, of Waikouaiti, had a substantial stock station connected with his whaling base in the early forties before organised settlement of the South commenced. He is reported to have had a piano, rather an astonishing fact considering the isolation of that district.

Strong representations to the New South Wales Government by Marsden and others, in which it was shown that New Zealand was a rapidly growing British colony, and also that the French were once more commencing to take notice of the country with a view to annexation, led to the appointment in 1839 of a Lieutenant-Governor, Captain Hobson. New Zealand thus became a province of New South Wales for purposes of administration. Shortly after his arrival Hobson had a stroke and, being unable to move about, rarely visited the southern portion of his district.

At that time colonisation was commencing in earnest round Port Nicholson, but immigrants, largely from Australia, were finding difficulty in obtaining land owing to the great confusion existing respecting vested rights. Ownership of land was a tribal affair, and no Maori could sell without the consent of the whole tribe. Land changed hands illegally, but later this transfer ended in much bad feeling. The New Zealand Company, formed in London by the Wakefields, possessed itself of fairly large tracts of land of a rather unsuitable nature, and in 1840 they brought many intending settlers to New Zealand, first to Wellington and later to Nelson. This New Zealand Land Company pressed the British Government, owing to much dissatisfaction over the rule of Hobson, and more particularly his advisory officials, to appoint a Governor, whose headquarters eventually became Auckland. New Zealand thus became a Crown Colony.

Emigrants to New Zealand brought out with them much pedigree stock, and as demand grew, other stock followed from Australia and even from Valparaiso. English breeds of sheep, cattle, pigs and dogs soon became common, for wherever a British settler makes his home, he must have flowers, vegetables and livestock of his native country if that be possible.

In 1842, the Plymouth Company settled Taranaki. Scotch colonisers settled Otago in 1848, while English settlers took possession of Canterbury in 1850. Sir George Grey, who was the Governor of New Zealand, and a man of high character, took considerable official interest in the Southern settlements, and was at Lyttelton to welcome the Canterbury pilgrims. Auckland was settled not by company methods but largely by influx of settlers attracted to the seat of Government.

From 1850 the increase in numbers of stock grew in an extraordinary fashion, particularly in Canterbury, where the merino and merino cross sheep throve. It is stated that the settlers of Canterbury imported 50,000 sheep, 3,000 cattle, and 300 horses in two years. The merinos came from Australia, and introduced scab and caseous lymphadenitis.

As a criterion of the fast improvement of conditions following settlement, it is recorded that racing and pastoral shows became established in 1858. In the later fifties horses bred in New Zealand, both draught and thoroughbred, were sold in Australia at excellent prices. Even as far back as 1859, a New Zealand-bred horse won all the best races, and in 1860 merino rams were sold back to Australia for £60 to £90 because of size and fineness of wool.

Numbers of Livestock in New Zealand

Date.	Horses.	Cattle.	Sheep.	Pigs.
1851 ...	5,600	60,000	560,000	—
1870 ...	70,000	3-400,000	9,000,000	—
1900 ...	270,000	1,300,000	20,000,000	255,000
1934 ...	276,897	4,192,023*	28,550,770	591,582

* Including 1,845,972 dairy cows.

The very great increase in numbers of stock can be directly or indirectly traced to the introduction of methods of freezing for storage of stock and the introduction of shipping fitted with insulated and cold chambers for transfer of meat and dairy produce to the British Isles.

It is 52 years since the first frozen-meat cargo left Port Chalmers in the sailing vessel *Dunedin*, taking 98 days to complete her passage to England. In that cargo, 3,521 mutton carcases, 449 fat lambs, and 22 carcases of pork were exported, realising £8,000 on the London market. Previous to 1882 a tinned meat trade had been developed, many factories being in operation in New Zealand in 1869. The usual practice of disposing of surplus sheep which were not required for home consumption was by boiling down for tallow. Sheep were originally bred for wool only.

Refrigeration raised the potential wealth of New Zealand very considerably and completely altered her trade, except for wool. From 1882 companies were formed to handle frozen meat, and by 1895 there were 13 in the North Island and nine in the South Island. By 1931, 22 freezing works were known in the North and 16 in the South, with a killing capacity per day of 3,640 head of cattle and 149,100 sheep, and a storage capacity of 5,582,549 carcases (60 lb.) of mutton.

During the Great War the whole export of meat was sold to the Imperial Government at a total price of £53,000,000. Since 1922 a Meat Producers Board has operated in the sale of meat, and the Board regulates shipping so that the home market will not become glutted.

In 1933 trial shipments of chilled beef using the CO_2 method were made, and the future of the beef trade, which at present is not very extensive and probably never will be, is directed towards the breeding of better and smaller beef animals and the shipping of them under chilled conditions.

As a result of the introduction of refrigeration the export trade of New Zealand stood at the end of June, 1934, at:—

		Valued at £
Wool ...	... 822,396 bales ...	13,287,458
Mutton	... 1,979,539 carcases ...	1,398,709
Lamb ...	... 8,403,470 carcases ...	7,358,435
Beef ...	... 440,620 quarters ...	962,145
	16,000 chilled quarters	
Pork ...	... 397,031 cwt. ...	950,183
Butter	... 2,825,889 cwt. ...	11,830,070
Cheese	... 1,992,244 cwt. ...	4,732,089
By-products from the live-stock industry	... ...	3,807,350

Disease Problems

As disease of livestock interests veterinarians more than does production from healthy animals, the greater part of my address will be devoted to that subject.

Reference to Stock Disease Acts makes it necessary to give a brief survey of the Government of New Zealand. Reference has already been made to the first Governors and the fact that New Zealand was made a Crown Colony. She was unfortunate in her first Governors, but in 1846 Sir George Grey (then Captain Grey), was appointed as one able to cope with financial matters in a new colony. It was on his advice, whether good or bad, that six Provinces were formed, each to have a Provincial Council with a Superintendent at its head. At the same time Parliament was created, with a Governor appointed by the Crown, a Legislative Council and a House of Representatives. Actually the Provincial Councils were in working order eight months before Parliament assembled, the first Parliament meeting in Auckland in 1854. It was not till 1865 that Parliament met in Wellington.

Provincial Government was carried on till 1875 when Parliament found itself powerful enough to carry on alone. Since then there has been one form of Government only. Proclamations, Acts and Regulations were made by Parliament and Provincial Councils to deal with sheep scab and pleuro-pneumonia. They were originally entitled the Scab, Catarrh and Sheep Inspectors Act, and the Cattle Diseases Act. The Eradication of the Sheep Scab Act was passed in 1878 by the new Central Government to replace the several Provincial Proclamations. In 1893 a Stock Act was framed which has since been consolidated, particularly in 1908, to incorporate all previous Stock Disease Acts. Under the new Act, Sheep and Cattle Inspectors became the Stock Inspectors of the present day.

Before dealing with the disease aspect it should also be realised that New Zealand is wholly placed in a temperate climate, and consequently has little or no concern with sub-tropical or tropical parasites or diseases. Rainfall is generally sufficient, though comparative drought can occur in Canterbury and Hawkes Bay. Owing to the fortunate extent and character of mountain ranges and prevailing winds the remainder of the country can always rely on sufficient water for stock and pasture. Rivers arise in snow and are fast-moving except in the Canterbury Plains, where the flat nature of the country has led to wide poorly-defined riverbeds covering and wasting large areas. Climate is such that animals are not housed except occasionally in the far south during the winter months, but rugging of cattle and horses during cold weather is resorted to as a general rule. Grass is the staple diet and grows most of the year round.

Isolation from other land masses since early geological times has left New Zealand free from harmful reptiles or mammals. Isolation by water in later days has kept the country free from some of the worst of animal disease scourges. Nevertheless a few diseases did enter after white colonisation, the worst being sheep scab and pleuro-pneumonia. Later, anthrax and blackleg were conveyed into the country in bone-dust.

Sheep Scab.—Sheep scab is the gravest contagious sheep disease with which New Zealand has ever had to deal, and the story of the cleaning up of runs holding 20- to 40,000 sheep, poorly fenced, and often extremely mountainous and wide is one of heroic endeavour on the part of run-holders and their appointed sheep inspectors.

Undoubtedly sheep scab came to New Zealand from Australia. Possibly as King took scabby sheep to Norfolk Island, and the first sheep were sent to New Zealand in 1805 from Norfolk Island, the disease was introduced then, but we hear little of sheep until 1842, when the settlers of the New Zealand Land Company introduced sheep with other stock. The first mention of scab is made by Alfred Saunders, who states that scabby sheep were introduced into Nelson from Australia by a Nelson sheep-owner. Saunders himself introduced various English breeds and found a ready sale for them, but they were clean. Certain it is that with the settlement of Canterbury in 1850, scabby sheep found their way not only from Australia but mainly overland in large numbers from Nelson and Blenheim. This is strongly supported by the fact that the sheep of North Canterbury as far south as the Waimakariri River were for many years ruinously affected and required extensive dipping to clean them from scab. Scab spread seriously in Canterbury because of lack of wire fences and the rough nature of the North Canterbury hill station, where sheep were lost. In 1862 sheep-owners commenced fencing, and stock inspectors were created. The first public dip in Canterbury was erected in 1867, but attempts to clean scabby sheep by dipping and dressing were well advanced at that date. In fact, many stations were heavily fined before 1867 for the numbers of sheep found by the inspectors to be affected.

The most effective dip was one made of lime and sulphur, the sheep being dipped at ten to 14-day intervals where possible. Tobacco was frequently used but proved a failure because there was no way of regulating the strength. Sulphur and tobacco dip was used on occasions, and was apparently successful. Treatment with arsenic killed many sheep and was not in common use.

In the Province of Wellington the Scab Ordnance of New Munster did duty until 1853, when the Provincial Council in its first session drafted a Scab and Catarrh Act repealing the original Ordnance. An analysis of the Act gives much historical detail of value, for inspectors were first appointed. Quarantine was established in June, 1854, to examine sheep coming into Port Nicholson. Branding sheep became compulsory, and breeders having scabby sheep on their properties in 1855 were promised a fine. In 1855 a further Act made it compulsory to pay a fee of ½d. a head on all adult sheep, returns of sheep

to be provided annually. In 1862 former Acts were repealed, and an Act covering scab, catarrh, and stock inspectors was passed. In this new Act, in addition to former clauses, new clauses were provided so that sheep could not be moved without certificate from the inspector. Moreover, inspectors were required to make annual reports to the superintendent of the province as to the condition of sheep on all stations. Should he find scab, the owner's name was to appear in the *Government Gazette* and one or more newspapers in the province.

All provinces made similar proclamations.

In Otago and Southland quarantine had been more carefully attended to, but, even so, scab appeared, and the *Otago Witness* of November 29th, 1862, says that in the sheep inspector's annual report, of 772,500 sheep in the province, 34,000 were diseased. Auckland and Taranaki had few sheep, and were not concerned to any extent with the disease. Nelson sheep, although little is said of them, must have been badly infested.

Mr. E. Clifton, the last of the old Inspectors of Stock, and formerly Chief Inspector of Stock, a man of over 80 years of age, has been able to give me the following interesting information with regard to scab:—

"Sheep scab was introduced with the first sheep from Australia. It was brought to every part of the country. In Otago and Southland it was detected and the sheep cleaned before they left the place of debarcation. In Wellington and Auckland the disease was allowed to remain in the flocks, from Wellington it was taken to Marlborough. This introduction of sheep was in the early sixties of the past century.

"When the Sheep Act, or Eradication of Sheep Scab Act, was passed in 1878, the disease was confined to North Canterbury, Marlborough, and Wellington, with a small area in the immediate vicinity of Auckland. North Canterbury was quickly cleaned. The disease remained in Marlborough for some years. Finally it was confined to that part of Marlborough between the sea and the Clarence River, almost to the Conway River. The country known as the Green Hills was finally cleaned by the owners. The large area of country known as the Clarence Runs was taken over by the Department in 1884 and cleaned the following year.

"Then there remained the seaward Kaikoura lands. On the eastern side to the sea, the country is deeply broken with ravines, the lower slopes are thickly timbered with many small natural clearings. On the inland side there is high country broken with gorges. A part called the "Jam" is well named. It was impossible to attempt to muster the sheep. They had simply become feral. They could be found in small lots over one whole area. So soon as disturbed they scattered in ones and twos to disappear in the timber or into the gullies or ravines. The means that led to success was the employment of 24 men to shoot, or when possible to kill them when they took refuge in the gorges. The men were divided in three gangs, but working in unison along the slopes of the country. These men were employed for more than two years. The last winter was the most useful, when the few sheep could be tracked in the snow. Something over 14,000 sheep were accounted for, fully one-half were unearmarked, that is, they had never been in a yard. There were many aged sheep with the wool worn at the ground. There were full- and broken-mouthed animals among those killed. Altogether some 30,000 sheep were destroyed. This included certain small flocks. This ended the infected sheep in the South Island.

"In the North-Eastern Wairarapa the last infected flock was finally cleaned about 1885.

"In the Auckland district at Miranda opposite to the Thames there was a supposed outbreak of sheep scab. The man in charge had to dip the unfortunate sheep eight times in eight weeks. The sheep were suffering from the well-known inflammation by the arsenic in the dipping preparation. The man was told to stop dipping. A certificate, the last in New Zealand, was given in April, 1890."

Sheep Catarrh.—Although the early sheep Acts included catarrh, there seems to be no record of the existence of that disease in sheep in New Zealand. Dr. Robertson, in his address of 1932, suggests that the condition was necrotic hepatitis, but would it not more likely have been hæmorrhagic septicæmia? The Act provided that all sheep dying or killed affected with catarrh should be burned or deeply buried, so there must have been considerable fear of contagion in the minds of stock-owners of the day.

Pleuro-pneumonia.—This entered New Zealand in cattle from New South Wales. The provinces affected were Southland, Otago, and Auckland. The Diseased Cattle Act of 1861 was adopted by all provinces, and it prohibited cattle being landed from Great Britain, Australia and Tasmania. Later Tasmania, Great Britain, Ireland and South Australia were freed from the embargo.

Infected cattle were apparently caught at the port of entry in Auckland and were slaughtered, the meat being supplied to troops during the Maori War. Southland was much less fortunate, for in 1863 and 1864 the disease became widespread and no cattle were allowed to be exported to the remaining provinces of New Zealand. Similar conditions existed in Otago. A policy of slaughter was adopted, and some time later in the sixties, the exact date being unavailable, the affected provinces became clean, and New Zealand has remained free from pleuro-pnuemonia since. Beef became so dear for a time that cattle were brought over from Australia for food in spite of pleuro-pneumonia restrictions. An interesting report appeared in the *Daily Telegraph*, Dunedin, dated January 18th, 1864, as follows:—

"It is with much regret that we learn that a lot of 234 head of cattle, recently imported from Twofold Bay, were found to be diseased with pleuro-pneumonia. When news reached here last week that some 20 or 30 of these cattle were dead, a deputation consisting of owners of runs and gentlemen connected with the cattle trade, waited upon the Superintendent in order to communicate this unfortunate circumstance to His Honour. These gentlemen were unanimous in their opinion that prompt action should be taken by the Provincial Government that the herd should be at once destroyed, and the neighbourhood where the cattle are now depasturing be proclaimed an infected district. His Honour acquiesced in the views of the deputation, so far as proclaiming the district infected; and it has been resolved in Council that the district from Hamilton and Waines' station to the mouth of the Waikouaiti River, extending over 25 miles. and from the same point to the mouth of the Shag River, be declared infected. It was also ordered that all cattle arriving from Twofold

Bay, which had been ordered previous to this date, should undergo strict examination, and still further notice prohibiting the importation into this province of all cattle from Twofold Bay after this date (13th instant). It is greatly to be regretted that the precautions in reference to the travelling of cattle and their constant inspection, which have been taken by the Governments of Victoria and Queensland, should have been entirely neglected in New South Wales. It is, we believe, almost impossible that an infected animal should reach us from any Victorian port. Our own precautions have been more than strict, especially in the face of prices that almost precluded the bulk of the population from enjoying substantial food. We hope to have to report that the prompt measures taken to eradicate the disease have been entirely effectual. The infected herd at Waikouaiti has been destroyed, and though we have heard rumours of the indications of disease in other quarters, we believe they are only occasioned by the little panic caused by the news from Waikouaiti."

The cleaning up of pleuro-pneumonia seems to have been due to the efforts of qualified veterinarians who had come out to the new colony, chief of them being Mr. Adam Hamilton, who became an inspector for Southland under the Cattle Diseases Act in 1864. Records show, too, that a Vaccination Act was passed in 1863 to treat pleuro-pneumonia in cattle in the south, but little seems to have been done and no record of actual vaccination exists.

New Zealand has been fortunate in that rabies, foot and mouth disease, glanders and rinderpest have never reached her shores. Tick fever and the responsible tick by further good fortune have not been introduced.

Swine fever certainly appeared in Wellington in 1933, but there is doubt as to whether the true virus disease ever entered the country previous to that date. Gilruth and Reakes, acting on the newly-discovered agglutination test for *Salmonella suipestifer,* decided that swine fever existed in many areas in 1894 and the following years. Reading reports carefully, one is led to believe that these conscientious administrators were dealing with necrotic enteritis. At one time slaughter of pigs became so serious that one wit said that it was not safe to be a pig in New Zealand.

Anthrax.—With the introduction of unsterilised bone meal from Calcutta for the purpose of top-dressing pastures, anthrax became temporarily established. The first case reported occurred in 1895 in the Waikato, but from 1899 onwards many outbreaks were notified in the Auckland and the Taranaki provinces. One case was found in Southland in 1904 following the landing of bone meal in that district, the cow having eaten some of the ground bone. Vaccination with Pasteur anthrax vaccine was attempted on at least one farm to protect the remaining animals, but judging from reports was not very successful.

Gilruth, by regaining the bacillus of anthrax directly from a cargo of bone meal landed in Canterbury, was able definitely to sheet home the fact that in bone meal lay the fault.

Gilruth fought hard for effective sterilisation of bone meal either at the port of entry or at the port of embarkation of the product. Bone meal was supposed to be sterilised at Calcutta, but no official control was exercised. In 1903 an inspector was appointed in New Zealand to oversee erection of suitable sterilising plants at the Bluff and at Auckland. These plants, however, were never erected, for in the following year it was decided to place inspectors in Sydney and in Calcutta to see that sterilisation was carried out in the country of origin of the product. New regulations dealing with the introduction into the colony of animal manures were issued in 1905. In that year about 650 tons of bone meal were imported from New South Wales, and 36,670 tons from Calcutta. Since 1907 about three outbreaks of anthrax have taken place, and two of these could not be traced definitely to bone dust, although there was a suspicion that early top-dressing may have been carried out. Sterilisation of bone meal insisted upon by Dr. Gilruth has saved New Zealand farmers from a very great deal of loss and officials from a great deal of worry. The astonishing fact is that these farms previously anthrax-infected are not reproducing fresh cases.

As the use of imported bone meal became superseded by other phosphates for top-dressing, inspection at the bone-crushing plants in Australia and Calcutta became unnecessary, and the inspectors were finally dispensed with and importation prohibited.

The story of *blackleg* is also largely linked up with the introduction of unsterilised bone meal into Taranaki and Auckland bovines. Cases were first diagnosed in 1901, and were investigated in 1902. The spread through North Taranaki was rapid, and a single vaccine made according to Kitt's method was imported from the United States of America to help cope with the disease. Regulations were gazetted in 1904 dealing with the control by making it illegal to travel stock out of defined areas without vaccination and branding, and making it compulsory to notify stock inspectors of deaths from blackleg. In 1906 the new Government Veterinary Laboratory at Wallaceville commenced the manufacture of vaccine in a similar way to that made in the United States of America, a dry powdered infected calf muscle heated for six hours at 97°C. and tested on guinea pigs and calves.

In 1910 the first report of blackleg occurring in the Auckland province came to hand. Spread from Taranaki had been guarded against, and it was thought that blackleg had entered Auckland in bone dust and had not spread from Taranaki. All calves in certain defined districts in the Auckland province were thereafter for some years vaccinated compulsorily, but the disease became widespread in certain Auckland districts.

In 1929 formalinised culture vaccine was prepared and placed in the field. By this time regulations had been relaxed to a great extent, complete compulsory vaccination having been discontinued. Those young cattle leaving Taranaki still required vaccination. Curiously, spread of blackleg to other districts has never taken place.

Reviewing the blackleg position, it would not be surprising if many cases of supposed blackleg in early days were actually malignant œdema, and with the introduction of a spore vaccine blackleg due to *B. chauvœi* became established. Vaccination was not considered potent unless an occasional death resulted in calves during the use of the vaccine. Had it not been for the guinea-pig inoculation test within recent years many cases of malignant œdema outside Taranaki and Auckland provinces would have been called blackleg and the calves vaccinated. With formalinised culture no harm

would result, but can we claim that for so-called attenuated spore vaccines?

Vibrion septique infection of lambs, hoggets, and sheep was at one time serious, but with better farming methods and the burning or deep burial of carcases, the disease has become almost non-existent.

Diseases Scheduled under the Stock Act of 1908

These require some mention. Those now present in New Zealand are actinomycosis, cancer, mange, tuberculosis and Johne's disease, the last having been scheduled in 1931. Of the scheduled diseases tuberculosis and Johne's disease are the most important.

Actinomycosis includes actinobacillosis and is treated frequently with pot. iod. tablets. Blood agglutination tests are also made to differentiate actinomycosis from actinobacillosis for purposes of treatment. The disease is common in many districts.

Epithelioma is common in cattle, but not in horses.

Sarcoptic *mange* exists in pigs, particularly white-skinned animals. On the appearance of the disease some five years ago it was made compulsory to treat affected pigs with fuel oil. Demodectic mange occurs in pigs and has been found in the last year in cattle, where it damages the hides so that in leather manufacture, blemishes exist with the appearance of hobnail boot marks. The disease in cattle is not recognisable in the live animal but causes considerable loss to the tanning industry. Possibly the parasite may also be found in Australia, for it is known in the United States of America, but is not common in Great Britain.

Johne's Disease is causing grave concern. The first case was seen 22 years ago, but no further cases appeared for some years. Recently in parts of Taranaki and the Waikato, a number of farms have been found running affected cattle. In all, 35 such farms are known. Johnin testing is in vogue, but until testing can be relied upon wholesale slaughter of johnin-positive reactors scarcely appears advisable. Johne's disease exists almost entirely amongst Jerseys, and has been recognised in a bull imported from Jersey Island.

Tuberculosis had been present for some time in 1893, and must have entered in early importations. When the Slaughtering and Inspection Act came into force in 1900 the extent of the disease was appreciated. The mode of living of cattle in the Dominion is not conducive to fast spread, and the average percentage of all animals found affected in any degree in slaughter-houses is slightly below 6. Town - supply dairies are licensed and are visited by inspectors. This has kept down open cases of the disease to a minimum. Human tuberculosis of bovine origin is negligible in New Zealand, and the small number of affected guinea-pigs found on biological examination of city milk supplies bears out this statement, for in more than 3,000 composite samples tested, positive cases of tuberculosis in the guinea-pigs have been 1·2 per cent.

Tuberculosis in swine is in the vicinity of 10 per cent. Pasteurisation of whey from cheese factories has reduced the risk to the clean pig considerably, but skim milk fed from home separators may be unsafe. With the increase of interest in the pork industry, tuberculosis is certain to be reduced, for export of pigs showing any infection with tuberculosis is now stopped.

Tuberculin testing is taken advantage of widely, the more so as the service is free, and only recently the Dairy Commission has urged the testing of all cattle in New Zealand, and the slaughter of affected stock. Effect may be given to this.

Bacterial diseases other than those scheduled are contagious abortion, mastitis of cows and sheep, cow pox, arthritis in lambs, caseous lymphadenitis, lip and leg ulceration of sheep, and distemper in dogs. Of these, contagious abortion and mastitis require special mention. Caseous lymphadenitis is now not of very great concern, being present in less than 2 per cent. of all sheep slaughtered. Palpation and care at shearing have been adopted as the means of eradication.

Contagious abortion of dairy cows is so well established that practically all dairy herds are affected. About 30 per cent. of all cows react to the agglutination test and some 5 per cent. of cows and 12 per cent. of heifers actually abort. Few abortion storms are now encountered, but in early years they played havoc with many herds. The difficulty of eradicating the disease is almost insuperable. The dangers attendant upon those herds which have been rendered free from *Br. abortus* makes one hesitate to suggest eradication of contagious abortion from single farms. Were it not for undulant fever which is occasionally recognised by the medical profession little attention would be paid the disease until practical means for its control became known.

Mastitis of dairy cows is perhaps the greatest source of loss to the dairy industry. Departmental research officers have put forward a system of control by grouping cows for milking purposes, based on the result of a quick and reliable microscopic test made monthly during the milking season. That, combined with teat disinfection following milking, is of undoubted assistance to the farmer when carried out fairly. Infection of the teat duct is considered to be of common occurrence, leading to a more or less chronic type of catarrh of the quarters, which finally may become clinical mastitis. Vaccines have been used extensively throughout New Zealand by proprietary companies and experimentally by Government officials, but without apparent beneficial results when used in controlled trials.

Dietetic Diseases

Dietetic diseases must at this stage be mentioned. New Zealand grows on her rich flats pasture composed of white clover and perennial rye grass, a pasture which is not bettered, even if equalled, in any country in the world. Her poorer unimproved country grows native grasses or the poorer types of English grasses which are very well able to sustain the life of the animal. The fodder crop for dairy cows and sheep is therefore pasture grazed as such or fed out as hay or as ensilage. Many animals get nothing else and thrive without supplementary foods.

The production and quality of pasture plants are therefore of vital importance, and the efforts of farmers and agricultural investigators have been directed towards continued improvement of this fodder crop. The use of selected varieties and strains of plants with heavy artificial fertilising and proper pasture management has resulted in the present high carrying capacity of some of our rich flat lands.

The fertiliser used is predominantly superphosphate, though basic slag is favoured in some

districts, particularly Taranaki. Lime is now slowly coming into use.

In grassland farming practice, animals are confined to a relatively small area of land, and any inherent deficiencies of the soil are reflected first in the condition of the fodder grown, and finally in the condition of the animal. No concentrates are brought in from other countries as is the case, say, in Great Britain, neither is there any variety of foodstuff grown to supplement the grass crop.

A permanent pasture showing 35 per cent. protein and a mineral content of 1 per cent. each of CaO and P_2O_5 has been the aim of farmers and agricultural advisers. Such a pasture requires feeding, and it is a point exercising the minds of many whether too narrow a ratio has not been obtained and whether the abnormal use of superphosphate top-dressing will not tend to produce dietary upsets of which we are yet in ignorance or which we are only commencing to recognise.

The dietetic diseases of grazing animals fall naturally into three different classes (*a*) a type due to deficiency of minerals, (*b*) disease conditions due to a food apparently too rich in one or another element, and (*c*) those troubles which fall under the heading of poor husbandry rather than direct deficiency.

Phosphorus deficiency in the form of Waihi disease was at one time a common occurrence in cattle and sheep in many districts. To-day it may be seen rarely in cattle, but more commonly in sheep, particularly in North Canterbury, where top-dressing is not carried out and the soil is normally low in phosphorus content. Here "bandiness" or "rickets" in young sheep is common. There is, however, evidence of too little available phosphorus in many animals, seen not so much in bone analysis as in difficulty in breeding. In the acutely deficient areas with a P_2O_5 of 0·2 per cent., anœstrum in cows is common, but there are many strips of country where a bone meal lick or superphosphate top-dressing is able to increase the annual percentage of calves and lambs very considerably. The quantity of phosphorus in the pasture may be completely upset by the greater percentage of calcium, and in parts of Taranaki this has been shown to be a definite cause of difficulty in breeding heifers and heavy-milking cows in the spring and early summer.

Deficiency of calcium is not known to the extent that phosphorus deficiency is. Cases where young sheep have grown on green oats which have had a normal phosphate and a very low calcium content have come to notice because of the osteoporotic condition of the bone and subsequent lameness. Similarly, although the case is not quite parallel, horses in Southland were at one time badly affected with osteoporosis due to the method of hand feeding with grain.

There are districts in New Zealand, however, which are definitely deficient in calcium throughout the year, and others just as opposite in being well supplied. What will happen with constant top-dressing of a protein-rich, calcium-deficient pasture with superphosphate? Is it too much to expect milk fever in cows and ewes? Such is happening in the Waikato where P_2O_5 is frequently found to be over 1 per cent. and CaO below 0·7 per cent. It is on such pasture that milk fever is very common. The opposite is found in Taranaki pastures where the mineral contents are reversed, where CaO is over 1 per cent. and P_2O_5 under 0·7. Here milk fever is almost unknown.

Similarly *magnesium* is lower in the Waikato than in Taranaki, and grass tetany is known in the former area and unknown in the latter. The low magnesium content of the blood in grass tetany can be connected by subcutaneous injection of magnesium salts in acute clinical cases, with recovery of the animal, but there is also reason to believe that the use of $MgSO_4$ in the drinking water, or dolomite in ensilage stacks, may aid largely in preventing the condition. Yet one does not feel sure that either milk fever or grass tetany is the actual result of depletion of the necessary mineral in the soil, but rather that such depletion renders the body susceptible to some other agent leading to clinical symptoms. Where grass tetany occurs, for example, many apparently normal cows on the same farm have as low a blood magnesium value as does that unfortunate beast which is showing acute clinical symptoms. Yet magnesium relieves the nervous spasms of the affected cow. The use of dolomite in ensilage stacks or as lick is our latest experimental development in grass tetany control.

While on the subject of mineral deficiency consideration must be given to that intriguing condition known as *bush sickness*. The use of limonite for a time allayed the search for the true cause of this anæmia. It was said that as the farmer was satisfied the scientist need probe no further, that it was obviously iron deficiency. When it was found that limonite was fickle, that some deposits were protective and others would not protect stock, and also that heating of limonite tended to destroy the effectiveness of the mineral, then the question had perforce once more to be opened. The Western Australian work, too, was disquieting to those who believed only in iron, but out of the whole position developments may be expected which will show that a "catalytic" agent, a little unsuspected, and rather overlooked, may prove the key to the whole position. Experimental work is in progress to show whether this key actually fits the lock of bush sickness.

There is a tendency in New Zealand to class all anæmia in stock as bush sickness; in fact, mineral deficiency, because of chemical bias, is the vogue where animals do not thrive, whatever the reason.

Though mineral deficiences occur, yet there may be conditions of over-supply of certain pasture elements which are detrimental to complete health. Temporary *sterility*, in the minds of those interested in research into this question in New Zealand, is divided into three subdivisions —low phosphorus, streptococcal infection of the bull producing cervicitis or even endometritis, and a condition of infertility of the bull not due apparently to bacterial invasion of the genitalia. In this last condition a bull is completely fertile one season; in the second he is slow in service, and morphology of sperm heads is not as good, while in the third season he is becoming completely sterile. Is a high protein conducive to such damage to the spermatogonia or is there in rich pasture composed of white clover and rye grass a protein incomplete in its amino-acid content for the production of normal spermatozoa? Rat feeding has already shown us that high percentages of full protein cause sterility, and protein such as that present in maize, which is deficient in some of the amino-acids, produces even more pronounced changes in the male organs when given in any

quantity. As many cows become pregnant in the summer after the flush of grass has passed, and as it has been noted that bulls tend to improve on poor native pasture, the significance of proteins in male sterility cannot be overlooked.

Diseases Due to Poor Farm Husbandry

Poor farm husbandry is also the cause of much loss to the farmer, particularly the sheep and pig and poultry farmer. A useful example is that condition in pregnant ewes known as *ante-partum* paralysis or pregnancy toxæmia. Where the farmer keeps his ewes in rising or even conditions from tupping to lambing no trouble results. By far the greater number of sheep farmers on good land, finding the sheep fat at tupping, endeavour to reduce their condition before lambing, or else, from lack of winter feed, they allow the ewes too little to eat. Intense fatty infiltration of the liver occurs, and the liver function is deranged so seriously that toxins are not broken down in the normal manner. The sheep becomes comatose and frequently, with kidney also damaged, dies speedily. A point asked in this disease is whether the fatty infiltration becomes a degeneration and is due to cloudy swelling resulting from a primary toxæmia or whether the infiltration is physiological. The latter would in our opinion be the case, for liver tests with rose Bengal show the liver to be normal in fat twin-bearing ewes until they have been starved for a short while, when the liver fails to excrete the dye as it should. Combined with this is the fact that sheep placed on young green pasture quickly throw off all signs of the trouble.

Pulpy kidney in lambs, although known to be due to absorption of toxin of *B. ovitoxicus*, is a disease seen mainly in the one type of lamb, and will no doubt be explained primarily as a dietetic upset rather than as a toxæmia when all facts can be obtained.

Parasitic gastro-enteritis of hoggets when Bunostomum and Œsophagostomum species are excluded would appear to be the result of poor husbandry. The wrong type of food is provided for the warm damp season. In dry seasons no trouble is experienced, but given young luscious pasture and warmth then many hoggets may die. That it is not entirely the parasite's fault is proved by the fact that hoggets, following or grazing with adult sheep, or following a lot scouring and dying, usually do well, suggesting that the type of pasture is the primary fault. The type of pasture in question does not permit chewing the cud, for the food is soft and watery and lacking fibre. Hoggets in this state improve when moved to native pastures. It cannot be denied that the parasite is a factor in the mortality, but apparently secondary and not to be compared with the Hæmonchus infestation of dry climates or Œsophagostomum and Bunostomum infection.

Amongst pigs, too, much loss is occasioned by incorrect methods of feeding. Better feeding, particularly with sufficient vitamin A, would seem to control both necrotic enteritis and pasteurellosis. However, the dairy farmer runs pigs as a sideline to use surplus skim milk, and he does not find it paying to feed extra fats or allow pigs the use of good grazing.

There are other dietetic diseases of stock about which little of the actual cause is known, but which annually take their toll. Enzoötic icterus of sheep, red-water of calves and cows, bloat of cows, photosensitivity in high-country sheep, and rape scald which spoils the pelts are well known, but there is still much to add to the knowledge regarding cause even in bloating of cows, a subject of special interest in that erroneous suggestions have been made that the high HCN of white clover may be conducive to a particularly fast-acting form of the disease.

New Zealand is more fortunate than Australia and South Africa in the comparative freedom it enjoys from poisonous plants. Some of the native shrubs are distinctly dangerous, notably, tutu, ngaio, Strathmore weed, rangiora, a buttercup, and the karaka berry, but many of the poisonous plants found dangerous are garden escapes or old world weeds such as ragwort. Ragwort has taken so great a hold of New Zealand that many areas appear as fields of golden yellow in the flowering time of the plant. Gilruth's work on Winton disease made it certain that ragwort was dangerous, but even ragwort poisoning requires the addition of further knowledge. Large quantities of the young plant have been fed without lesions developing in sheep, and yet other stages of growth of the plant may be found particularly dangerous. A point of interest in connection with ragwort in New Zealand at any rate is the fact that saponins are not found present.

Veterinary Profession

Before concluding, I should like to say something of the veterinary profession in New Zealand. As in all other walks of life, there were enterprising veterinarians who followed or possibly brought stock to the Antipodes. Some became cattle and sheep inspectors, particularly in the scab and pleuro-pneumonia outbreaks, while others remained in private practice. It is difficult to get actual numbers, but in 1881 there was a list compiled and published in *The Veterinarian* giving the names of 15 qualified practitioners in the colony.

Private practice does not flourish in New Zealand at the present time. Stock-owners do not require the attention to individual animals to the same extent as they do treatment of the flock or herd. Consequently pressure is brought to bear on the State service to cope with these unprecedented conditions. There are, however, a few private men who prefer independence and have not become subservient to the State. The peculiar condition in the Dominion should make employment of veterinarians by dairy factories a useful form of private practice and actually that co-operative system is gradually coming into operation.

With the organisation in 1892 of the Agriculture Department from the amalgamation of the Stock Department and Agriculture section of the Lands and Survey Department the health of the livestock was virtually placed in the hands of veterinarians. In 1892 one veterinarian was in Government employment. In 1893 Mr. J. A. Gilruth was brought out to New Zealand and quickly made his presence felt. What the Wakefields, Cargill, Godley and Saunders were to the early provincial settlers so Gilruth was later to the stock-owner. Coming as he did when agricultural science was being found essential, he became the wise counsellor of the Government and an efficient warrior for the veterinary service. It was Gilruth who established the profession on a scientific basis, investigating animal diseases and controlling meat export. Strong enough to gain his own ends, he assisted in moulding the Agriculture Department very con-

siderably to his own liking and laid the foundation of the Livestock Division as we have it to-day.

Gilruth was made chief of a Veterinary Division in 1897, the duty of which was to investigate animal diseases in the colony. In 1899 there were four veterinarians on the staff, including the present Director-General of Agriculture, Dr. C. J. Reakes, who joined in 1897. In 1900 ten more veterinarians were engaged, mainly for meat inspection. In 1901 15 more men were appointed to the Department, being chosen in London by Gilruth himself. The engagement of so many officers followed the enactment of the Slaughtering and Inspection Act of 1900, which provided for the compulsory inspection of all export meat. Therefore by the end of 1901 there were at least 30 veterinarians in Government employ. Slaughter at meat export houses was directly under veterinary supervision, laymen assisting in the actual inspection.

In 1908, Gilruth resigned his position as Director of the Veterinary Division to become Professor of Pathology and Bacteriology in the Melbourne Veterinary School. Dr. C. J. Reakes was appointed to succeed him as Chief Veterinarian.

In 1909 the whole Department was reorganised, and a Division called the Livestock and Meat Division was created. That Division exists to-day as the Livestock Division.

Research work in animal diseases was very ably carried out by Gilruth and his staff, and early reports give thorough and detailed results of experimental work. The departmental laboratory at Wallaceville was established in 1905, and except for certain additions still does duty as a centre for the Dominion in diagnostic routine and research work. Other Institutes are slowly arising, such as the Agricultural Colleges and the Cawthron Institute, but there is as yet a marked lack of co-operation between Institutes. Deficiency diseases have, in the past, been largely left in the hands of a chemist who is not a veterinary pathologist, and as previously stated it has become rather the vogue for the results of poor farm husbandry to be termed one or other of the deficiency diseases.

However, nutrition work is gaining ground at Wallaceville, where a staff has been accumulated which can deal with the biochemical and nutritional and pathological sides of disease problems.

Finance for research work is all provided by the Government. Rich stock-owners or breed societies have not yet seen the need for their assistance. Consequently research work, although not completely starved, to be in the fashion shows a form of atrophy due to deficiency of the proper monetary food.

May I say finally that we who live in New Zealand and work there with livestock expect a much greater increase of stock and produce concomitant with better farming methods and reduction of disease. Dairy cows average to-day 230 lb. butter-fat per annum. Production will easily increase to 300 lb. and over. We hope that better means of distribution will shortly be found to absorb our produce. With the increase in production more investigation into nutrition diseases will be required, for fresh problems will appear or older problems will become accentuated. It is to that side of investigational work that we hope to turn, for who knows, for instance, what the effect will be of upsetting pasture balance by continuous top-dressing with phosphatic manures?

Our isolation from continents has been our strength. It is a weakness, however, when it inhibits us from discussing our problems freely with our neighbours.

A GENERAL SURVEY OF THE BREEDING PROBLEMS OF THE SHIRE HORSE

O. V. GUNNING, M.R.C.V.S., D.V.M.
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When your President asked me to come and address you again this year I felt rather reluctant to do so—not that I did not very fully appreciate the honour, but it seemed to me that someone new would present the subject from another standpoint, and to have a subject dealt with from a different angle has many advantages. However, when your President assured me that it was the wish of the members of your Society I readily consented, as I retain very pleasant recollections of your generous hospitality and kindnesses when I visited you last year. At the same time, I trust that if I duplicate any of the ground covered in my previous address you will make due allowances and make up for the deficiency by having a good discussion.

You will recall that my subject last year was "The Shire Brood Mare and the Ante- and Post-Natal Care of the Foal." To-night I propose to discuss in a general way some of the breeding problems connected with the Shire horse. The two subjects are really very closely interwoven and it is impossible to draw a hard and fast line between them; for you will readily understand that much of the care of the in-foal mare, if properly carried out, will be a direct attack on many of the worst breeding problems—problems which are of such enormous importance to the horse-breeding industry that they are well worthy of further consideration.

It is a disconcerting fact that since records were first kept of premium stallions in 1899[1] there has been a constant decline in the fertility rate; indeed, the mean fertility rate has fallen from 61 per cent. to 50 per cent. The same records have been kept for heavy horses since 1914 and only minor differences exist. This, of course, only touches a fringe of the subject, for, in addition, there is the ever-recurring heavy mortality amongst foals of which, as far as I am aware, no records exist.

In presenting my subject, it is first necessary to ask, what do we understand by the term "breeding problems": what do they comprise? I think, in a broad way, we can classify them under three heads:—

(1) *Sterility*: The difficulty of getting animals to reproduce their kind.
(2) *Foal Wastage*.
(3) *Unsoundnesses*.

The next question is to try and find out the cause of this serious state of affairs and see if there are any practical ways and means of preventing or mitigating the devastating losses to which the horse-breeding industry is subjected

*A lecture delivered to the Mobberley and District Shire Horse Society, October 24th, 1935.

year after year. To this end, I would suggest the following four main lines of attack:—

(1) By paying more attention to heredity and selection of breeding stock, in the first place.

(2) By devoting greater care to feeding and to the improvement of pastures.

(3) By emphasising the importance of increased study and practice of the breeding hygiene of the stallion.

(4) By paying greater regard to breeding hygiene of the mare, with special reference to sterility.

HEREDITARY DISEASES[2]

The first step in attacking our breeding problems is to breed from sound parents. By that, of course, I mean parents free from those diseases which are likely to be transmitted from them to their offspring and which we know as hereditary diseases. Suitable animals which have received an injury and are permanently lame may obviously be retained for breeding with the best advantage, but every breeder should have sufficient knowledge to be able to discriminate between what and what not to breed from and in case of doubt should call in professional aid.

The Stallion Laws to a great extent secure the soundness of the stallion—but not entirely, as I have knowledge of cases of entire stallions, known to be unsound, retained for breeding purposes at home—and I am not aware of any more certain method of perpetuating unsoundnesses in the Shire breed. In the case of mares the responsibility lies entirely with the breeder, and I cannot impress on you too strongly the folly and short-sightedness of breeding from mares suffering from disease which will in time be transmitted to the offspring.

The hereditary diseases, according to the Horse-breeding Act of 1918, are as follows: cataract, roaring, whistling, ringbone (high and low), side-bone, bone spavin, navicular disease, shivering, stringhalt and defective genital organs. You will note that, of this list of scheduled diseases, one affects the eye, two the wind, four the bones, two the nervous system, and one the genital organs.

Cataract is a disease affecting the lens of the eye, causing an opacity deep in the eye-ball. This must not be confused with opacities or cloudiness of the outside covering of the eye usually caused through an injury and commonly called "whip-marks." The latter, while causing an unsoundness of varying degree, according to their extent and position on the eye, cannot be transmitted to the offspring and there is no objection to breeding from animals with opacities which do not actually affect the lens.

Roaring and Whistling.—It is most important not to breed from any stallion or mare unsound in its wind.

According to the degree of sound emitted the condition is referred to as roaring or whistling, but, no matter how slight, the condition is an unsoundness.

Ring-Bone, Side-Bone, Bone-Spavin and Navicular Disease.—*Ring-bone* and *side-bone* are not infrequently confused by horsemen. They are both due to bony formation taking place in the horse's foot.

Ring-bones are bony deposits which form either between the lower pastern or foot bones, or between the two pastern bones and which are usually to be felt as bony formations around the coronet except over the seat of side-bone. As they involve a true joint, they are far more serious than side-bones, especially if they form right in front, thus interfering with the flexion of the joint. Ring-bones cause serious lameness, which is often incurable.

Side-bones are due to the cartilages which lie on each side of the foot developing into bone. The cartilages normally allow expansion of the foot when the frog comes in contact with the ground, but when the side-bone develops it, of course, prevents this expansion. As a matter of fact, side-bones are an over-estimated unsoundness in geldings, as they cause little inconvenience to a horse doing slow work, but from a breeding point of view they are important and we should never breed from a mare or filly showing this defect.

Spavin is also due to a bony deposit which occurs in the inside lower region of the hock joint. The spavin may organise and the usefulness of the animal be retained, but more frequently the gliding surfaces of the hock joint become involved and incurable lameness persists.

Navicular Disease is due to a disease of the navicular bone. The disease is more common in light than in heavy horses and is most frequently found in animals that have done a lot of fast work on hard roads. It is a progressive disease: once established it continues to get worse and there is no cure.

Stringhalt and Shivering are, as you are aware, diseases of the nervous system.

Stringhalt is usually easy to detect and is characterised by a peculiar and excessive flexion or bending of the hock as the animal walks along.

Shivering, on the other hand, is often one of the most difficult diseases to diagnose, especially in the early stages, although as in stringhalt, when the disease is advanced it is very easily detected. The affected animal has difficulty in backing and when it does back the hind legs are stiffened and a peculiar quiver goes along the tail. In the early stages the animal may only show a very slight quiver—usually down one hind leg—and this may only occur at certain periods, usually when the animal is cold. During the interval between the symptoms the animal may go perfectly sound and if pulled out for a severe examination may show absolutely nothing at all to arouse suspicion. It is these cases which give the most trouble and frequently lead to sale disputes, if not litigation. Shivering is a condition of a high degree of importance because it is a progressive disease; that is, when an animal is affected, no matter how slightly, recovery never takes place. Further, the condition will eventually get worse: it may be quickly or it may be after some years, but you can rest assured that sooner or later the horse will become worthless.

In connection with shivering, one must, I think, also consider "jinked back" and other similar diseases where the animal has difficulty in backing or holding a load back, or is giving other indications of a lack of proper control of the hind quarters.

While these conditions may not be specifically mentioned as being of an hereditary nature, I should always hesitate to breed from any animal showing any kind of spinal trouble.

Diseases of the Genital Organs.—The most important disease in this respect is in the case

of the entire where one testis is retained in the abdomen. Such an animal is commonly called a "rig."

Where one testicle only is retained the animal may be perfectly fertile. The condition is undoubtedly hereditary and such an animal should on no account be used.

I have discussed the hereditary diseases at some length as I cannot impress upon you too strongly the necessity of breeding only from animals that conform to a strict standard of soundness, for the first great law of heredity is that like produces like. This law should be the sheet-anchor of the breeder.

The question of breeding is many-sided and it must be admitted that many of the influences that govern the process are not well understood. At the same time, some of the laws are fairly constant and it is up to every breeder who aims at the highest measure of success to have a fair knowledge of these laws. He should be familiar with the broad principles which govern breeding, as far as they are known, and be able to give these practical application.

In the first place, it should be within his power to discriminate pedigree and place its value at its true worth. He should have an ideal standard in his mind and should breed only from parents which, as far as possible, conform to that standard, breeding from long lines of pure blood, especially male, and mating with the view of correcting the defects of the parent in the offspring. Never lose sight of the fact that fertility is an hereditary character, and breed from strains which are regular breeders. I am of opinion that an almost total disregard of this law is one of the biggest errors of modern live-stock breeding. However careful one is, there will always be shocks, set-backs and disappointments through variations we do not at present understand, but this should only stimulate the breeder to a stricter adherence to the purity of his breeding.

The definite aim of the breeders should be the improvement of those qualities which mean so much to the Shire horse—quality and constitution; good feet; clean bone; straight, silky feather, and ridding the breed of commonness. The man who breeds from unsound mares with bad feet, boggy joints and gummy legs with a tendency to grease is a traitor to his Society.

Before concluding my remarks on heredity and breeding, I should like to tell you that it is a subject which is attracting considerable attention at the present time. Dr. Crew, of Edinburgh, has done much work on the breeding side of the question, while Professor Mitchell, M.R.C.V.S., of the Royal (Dick) Veterinary College, is engaged in research on the disease aspect of heredity.[3] He has put forward the theory that some at least of the hereditary diseases may, after all, be dietetic and due to incorrect feeding. At any rate, it is true that bony growths, similar to those we know as side-bones, ring-bones, splints and spavins, occur on all parts of the skeleton of the horse. Professor Mitchell puts forward the view that errors in diet may be the cause of the bony deposits and the age-old practice of feeding horses, from foalhood upwards, on an almost exclusive diet of hay and oats is wrong in principle. It is his belief that horses require a more varied diet, inasmuch as hay and oats do not supply a diet sufficiently complete in minerals and vitamins.

At present, however, these researches have not been carried sufficiently far to lead us to alter our views on hereditary disease; in fact, I most strongly advise you to pay more attention to the latter than ever. At the same time, the researches referred to do teach the great necessity of paying more attention to diet and therefore I propose briefly to discuss that subject.

DIET AND THE PREVENTION OF DISEASE

In studying the breeding problems of horses, we cannot overlook the important part correct feeding plays in the prevention of disease.

In the old days, before the advent of intensive farming and high production, it is highly probable that farm animals were able to obtain far more of the essentials of nutrition as nature intended; however, to-day, with highly intensive methods and the craze for abnormal production we are forced more and more to the view that deficiencies and unbalance in rations are either the predisposing cause or actual cause of many of the conflicting diseases we encounter—and not the least amongst these are sterility and diseases of the new-born, and probably unsoundnesses.

It is true to say that the horse breeder has available to him at the present time an abundance of new knowledge which, if applied, would assist in correcting or lessening many of these abnormalities—in the first place, enabling him to give a more scientific attention to his pastures and in the second place, by making it possible for him to feed a ration from foalhood to maturity sufficiently varied and balanced to supply the essentials of growth during its various stages.

Improvement of Pastures

No one with any powers of observation can live and work in an agricultural district without realising that many pastures are sadly neglected. Some are worn out; others seriously depleted, badly drained, sour and rank, or suffering from over- or under-stocking.

The Rowett Institute[4] has been investigating for several years what may be termed abnormal pastures—pastures which, on account of some deficiency are abnormal in their relation to animal growth. From their investigations it would appear that rate of growth, underpercentage of fertility and health, is roughly parallel with the percentage of silica-free ash and they also show that there is a definite co-relation between minerals and protein. It is possible that small deficiencies of various minerals may yet be found to be of equal importance in some cases. You will appreciate the fact that the lack of just one necessary substance may upset the whole balance of the animal's system. Phosphorus and lime are the minerals removed in the largest quantity from the soil and both these substances are likely to be lacking; while on the lighter soils there may be a deficiency of potash and a practical farmer, whose opinions I greatly respect, assures me that on his heavier land he finds beneficial results to follow from the application of potash.

From a practical point of view it may not be possible always to find the particular deficiency from which the soil, and consequently the pasture, may be suffering, but I am sure that nothing but good could accrue from a study of cultivation, drainage, the method of grazing, the rotation of different classes of stock, and the application of suitable manures.

The object of these remarks is only to point out, from a veterinary point of view, where pastures may be lacking, and I strongly advise you to work in co-operation with an agricultural specialist in pastures.

If grass is deficient it is very certain that hay made from that grass will be deficient also and this brings us to the question of feeding.

Feeding

The ideal to be aimed at in feeding is to feed the animal from the time it begins to eat with those foods which supply the elements of growth minus over-stimulation.

According to Morrison,[5] of the Cornell University, recent studies on the amounts of protein required for various classes of livestock and working horses show that these animals require somewhat less protein than is advised in previous feeding standards. These findings only tend to stress the disastrous dangers of over-forcing. It has been definitely proved[6] that bone disease follows over-forcing in growing animals. Underfeeding is equally disastrous, but I think in our best Shire animals over-feeding is by far the greater danger. In this connection, I should like to quote those two authorities, Marshall and Hammond.[7] They say that a condition of adiposity is a very common cause of infertility. Very fat animals do not come in season in a very marked way and when they do so the periods are apt to be irregular and likely to be missed, or the animals may fail to breed altogether. The value of prize animals is such that it induces the farmer to fatten them to so great an extent that they are rendered sterile, at any rate temporarily. Thus animals belonging to the best strains and possessing the most desirable characters are, for the time being at least, lost for the purpose of breeding.

Conversely, Wall,[8] referring to the blood-stock districts of Kentucky, states that many of the most outstanding yearlings produced on the track and in the show ring were not fed excessively, but kept on a satisfactory growing ration. For instance, if growing colts get plenty of legume hay (the clover varieties) they will not lack calcium, as legume hay is always rich in calcium,[5] also, most protein-rich foods are rich in phosphorus, especially wheat bran, wheat middlings, linseed and cotton seed; therefore when these are supplied to the rations in reasonable quantity, phosphorus will not be lacking in the ration. Where there is any doubt about the calcium and phosphorus content of the ration, a simple reliable mineral mixture should be supplied. This is particularly true where meadow hay is used.

Apart from minerals, there are the vitamin deficiencies, and much advancement has been made with the study of these in regard to animal nutrition.

BREEDING HYGIENE OF THE STALLION

The importance of a potent sire cannot be over-estimated. He stands in a position quite apart from that of the female. If he is lacking in potency it may affect numbers of mares, with disastrous results to the community in which he travels. The science of genetics teaches us that, other things being equal, the influence of the stallion and that of the mare are equally divided, but since a stallion serves 80 or more mares during the season, its good or bad qualities are distributed in quantity in the proportion of 80 to 1.

In spite of this fact, we find that very little serious attention is given to the stallion with the view of retaining his best breeding powers. It would appear that far more emphasis is placed on having him hog fat for the Stallion Parade at the commencement of the season.

As a matter of fact, as obtains in the case of a hunter or a work horse, fat is of little consequence to the stallion; what is required is hard muscle and fitness. In certain districts in France it is customary for the stallion and the bull to work together on the plough and they are merely unhitched when required for service. Such animals are far more likely to be fertile than pampered and well-fed entires, as often seen in this country.

Each stallion must be studied as an individual and for him to be successful, his care, feeding, exercise and handling must conform to a scientific standard suited to his individual needs and to the work that is required of him.

Within normal limits, frequent use does not impair a stallion's fertility. The investigations of Sanders[1] also show that stallions vary in their fertility and that there are definitely good, bad and indifferent getters of foals. The most striking result is the decline in fertility with stallions 16 years old and over.

A certain number of stallions are sterile, and the more highly-bred the animals the greater the percentage of sterility will be found to be. It is wrong to assume that a stallion is potent because he looks all right. A stallion may serve mares and appear normal in every way, yet be sterile. At any time where a stallion has served a number of brood mares and they have returned to him, immediate steps should be taken to ascertain the cause. A short time ago I had such an experience with a pedigree bull. I collected semen and from microscopical examination we were able to demonstrate without doubt that the animal was sterile. By similar quick action expense will be saved and disappointments averted.

From a breeding efficiency standpoint, it must at all times be borne in mind that a normal healthy stallion may at any time become temporarily or even permanently sterile or, through infection, a grave danger to the mares he is serving. This may be due to the stallion becoming tainted from an infected mare and in this respect may I here remind you that a great responsibility lies with mare owners to see that no mare is ever presented for service unless she is in a healthy state.

A sterile condition may also develop due to disease contracted by the stallion,[9] contagious cellulitis or pink eye: a contagious fever of the horse which also affects the genital organs of stallions. This may also be transmitted by the stallion to susceptible mares. There are, in addition, infections of the organ which may also be transmitted by copulation. As stated above, it must always be borne in mind that infections of the stallion's genitalia may exist without any visible signs of disease and which can only be recognised by a microscopical examination. It therefore behoves the stallion attendant to be ever on his guard and should his charge show the slightest sign of being off colour, or a temperature, it should at once be taken out of work, taken off corn, and professional aid sought.

The practice of cleaning the organ with non-irritant disinfectant after each service, if properly carried out—and I emphasise the word "properly"—is a much neglected and praiseworthy operation.

Before leaving the subject of the stallion I should like to mention one other point. One often hears the statement that a certain stallion is getting a lot of joint-ill foals, or that a certain stallion is not stopping his mares or a lot of his foals are twins or born dead; in fact, to blame the stallion is an easy way of venting one's disappointment, but most of these loose statements are made without any proof, statistics, or authentic information. These statements, if investigated, are invariably entirely unwarranted and are likely to do a grave injustice to the stallion and his owner. It would be more profitable to try and find the real cause, which it is more likely will be found with the mare or infected buildings.

BREEDING HYGIENE OF THE MARE, WITH SPECIAL REFERENCE TO STERILITY

In discussing the breeding problems connected with the Shire horse, I feel there is none more important than the treatment of the mare. I do not wish to under-estimate the value of having a stallion that is fertile and virile; at the same time, I do feel that as a whole breeders treat too lightly the necessity of having the mare clean and healthy at the time of service. There is a tendency to have the mare tried, to have her tried and served again if necessary, and to blame fate if she fails to become pregnant—and bother no more about it.

My object is to try and point out to you some ways in which at least some of the conditions causing trouble can be remedied.

Now in the mare, perhaps more than any other animal, we have to view the cause of the trouble from two different standpoints:—

I.—The existence of infection or disease through infection;

II.—The existence of a physiological cause.

In discussing the first—sterility due to diseases—it may be said that it is probable that a large majority of these conditions have a simple beginning and that is the time to attack them. At the Research Station at Kentucky[10] where much valuable work has been done on this subject, it has been found that in at least one out of every three mares examined there was an inflammation of the cervix and uterus. It must be realised that all diseased animals are spreaders of infection. By another important piece of research carried out at Kentucky it has been found that the streptococcus—the organism responsible for the most common infection to which the mare's uterus is prone—lives in a non-pathogenic or harmless state just inside the lips of the vulva in apparently normal mares, in much the same way as the common cold germ lives in parts of our mouths waiting for the opportunity to set up infection when the resistance of the host is lowered. It is therefore easy to understand that when the vagina or its neighbouring parts become torn, as they frequently do during the act of parturition, or where the mare aborts leaving an unhealthy condition of the uterus, these and other similar conditions greatly predispose the mare to a permanent infection of the womb. It is therefore most necessary to have these injuries properly treated at the time, or, in the case of abortion, the mare should be examined and professionally treated until she is normal again. By a few applications of treatment at this time the majority of conditions will be easily remedied. On the other hand, if they are allowed to go on unheeded, they develop into chronic inflammatory conditions of the genital tract (causing differing degrees of sterility) varying from an obstinate chronic inflammation to a uterus filled with pus. At this stage treatment is lengthy; it may take months, and even then permanent damage to the tissues may have been done, rendering the animal sterile.

We now pass to a consideration of the second standpoint from which we have to view the causation of sterility in the mare—that in which the cause is a physiological one. It is most important, although I have time only to discuss it briefly.

As I mentioned last year, the heat period of the mare[10] lasts seven to eight days or longer. The ova, or seed, from the ovary are shed at a definite time in the heat period—which, in the mare, is just before the end of that period—and if active seed from the male are not present the seed dies within a few hours; conjointly, the seed from the stallion when deposited in the mare does not live more than a day or two. From this you will readily see that if the mare is served by the stallion early in the heat period, although everything may be normal there is no possible chance of her becoming pregnant as the seed from the stallion will die before the seed from the mare's ovary has been shed.

It will therefore be seen that with the stallion going his weekly round it is more than probable that a large proportion of mares may be barren, for the simple reason that they never become served at the vital time towards the end of the heat period. The obvious remedy is that all healthy mares that refuse to hold should be tried every third day during the heat period.

My advice, therefore, is to tackle the problem of sterility in the mare from two points of view. First realise that all infected mares are spreaders of infection and until the particular condition is righted it is a useless and wasteful process to keep attempting to get them in foal, and, secondly, should your barren mare prove to be healthy, see to it that she is served at the vital time in her heat period, which is towards the end.

At the Breeding Station in Kentucky it is the custom about three months after the breeding season to examine for pregnancy all the brood mares that have been tried. Those that are pregnant are vaccinated against abortion and are handled and fed according to the best known methods. On the other hand, those that are barren are examined clinically and bacteriologically and then each case is treated on its merits. By this means any necessary treatment can be done during the winter and much valuable time saved. I feel sure that if the veterinary practitioner was utilised in this country in a similar way, nothing but good would accrue.

It must also be remembered that breeding is a physiological act;[12] you cannot expect the best results if a mare is served and immediately subjected to an exhausting day's work and, conversely, you cannot expect them if after a grueling day's work the mare is taken several miles to the stallion and then perhaps turned out for the night to take her chance.

In reviewing the foregoing incomplete remarks, if there is one point that strikes me more than any other, it is the paucity of literature and the astoundingly limited amount of research that has been carried out in this country into the breeding diseases of horses. When one considers the greatness of the horse industry in Great Britain, and the enormous capital at stake, such a state of affairs is nothing short of remarkable.

I wish to congratulate the Mobberley Shire Horse Society on the lead it has taken in fostering interest in the problems which confront the horse breeder generally. If my few remarks will in any way stimulate a closer co-operation between the agriculturalist, the veterinary practitioner and the research worker, I feel that my small effort will be richly rewarded.

References

[1]Sanders, H. G. "On the Fertility of Stallions." *J. Agric. Sci.* 16.

[2]Shaw, T. "Animal Breeding."

[3]Mitchell, W. M. "A General Consideration of the Unsoundness Problem in the Horse." *Vet. Rec.* No. 35. Nov. 7th, 1931.

[4]Orr. "Minerals in Pastures."

[5]Morrison. "Recent Advances in Animal Feeding and Nutrition." *North Amer. Vet.* Aug., 1935.

[6]Marshall and Hammond. "Fertility and Animal Breeding."

[7]Dimock and Healy. "The Chemical Composition of the Blood and Urine of Colts." *J. Amer. Vet. Med. Ass.* Dec., 1933.

[8]Wall, J. F. "Practical Light Horse Breeding."

[9]Williams. "Diseases of the Genital Organs of Domestic Animals."

[10]Dimock and Edwards. "Pathology and Bacteriology of the Reproductive Organs of Mares in Relation to Sterility. Bulletin 286. Kentucky Exp. Sta.

[11]Walton. "Technique of Artificial Insemination."

[12]Marshall and Crossland. "Sterility in Mares with Recommendations to Breeders of Heavy Horses." *J. Board Ag.* Vol. xxiv.

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A Contribution on the Pathological Aspect of the above*

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We have had read to us to-night an excellent paper on a Shire horse breeder's troubles, delivered by one who is an undoubted master of his subject. Captain Gunning not only has all the available knowledge at his command, but he leaves no stone unturned in an effort to add to our knowledge by prosecuting such investigations as are possible for a busy practitioner. I am in a position to say that at the present time the essayist and myself are conducting a kind of preliminary bacteriological enquiry into the question of sterility in the mare and the part played by inflammation and microbial infection of the genital system, as sterility, as you know, is one of the biggest problems, if not the biggest, that the horse breeder has got to contend with and it is in this particular aspect of the paper that I propose to try to interest you for a few minutes.

Please do not imagine that I have come laden with information—I wish I had. I am amongst you to-night as a very interested student of this important and intricate subject. It is a subject which bristles with difficulties and this is probably one of the reasons why so little attention has been devoted to it in the past, despite the enormous wastage in breeding power and the pecuniary loss for which it is responsible both to the individual owner and the country. Let us first of all approach this subject as beginners. What do we understand by the term sterility? Briefly, it means the inability on the part of the male or female to reproduce its kind. Although it is frequently referred to as a disease, it is, strictly speaking, not a disease but a symptom and an indication of the fact that there exists some abnormality or disease of the male or female apparatus which is interfering with the normal process of pregnancy. There are a whole host of possible causes, most of which have been adequately dealt with by Captain Gunning. First of all I must point out that we can never hope to be entirely free from sterility as a certain number of cases occur as a direct result of organic lesions and abnormalities or possible displacements associated with genital organs. These will always happen, just as they occur in other organs of the body and in other species of animals and man. In the case of minor ailments, such as displacements, "insemination" might be the means of ensuring conception.

We must also not overlook the hereditary fertility factor. There appears to be no doubt, although no satisfactory explanation is forthcoming, that some perfectly healthy mares only produce a foal every two years. We, in this discussion, are more particularly concerned with the preventable forms of sterility, those diseases for which we are responsible through incorrect feeding and faulty management and that form of sterility which is the result of bacterial infection. I now propose to say a word or two about each of these in turn.

Sterility due to errors in feeding has been emphasised by Captain Gunning. There is no doubt that over-feeding is a common failing and that this, in conjunction with the present intensive and forceful methods, is responsible for a great deal of trouble. In connection with feeding may I mention one or two possibilities which may occur.

(1) Vitamin deficiencies with particular reference to vitamin E. Its association with sterility in rats has been proved but it has still to be shown that it is responsible for sterility in the larger animals. At the present time we know very little about this reproduction vitamin. It is very plentiful in green food, particularly lettuce and it is also present in wheat and hemp seed. Deficiency leads to delayed results. In the female, degeneration of the embryo occurs, but in the male you get degeneration of the testicles, which is practically incurable. Wheat germ oil is the remedy.

(2) Mineral deficiencies and imbalance.

You will probably say to yourselves that these are not very likely, considering the circumstances under which horses are kept at the present day. When I tell you that I personally have investigated cases in young thoroughbreds, which one would have thought were reared under the very best conditions, which proved to be due

* Made in opening the discussion on Captain Gunning's Lecture.

to mineral deficiency or imbalance, you will realise that one cannot lightly overlook such possibilities. I am in entire agreement with Captain Gunning when he states that too little attention is paid to this aspect of the subject. To single out one example, I should add that iodine should be rationed to all breeding and growing animals.

Then again, there is the question of internal secretions. Everybody is familiar with the important part that such glands as the thyroid gland, the adrenal gland (the source of insulin) and others play in the normal functioning of the body. Is it possible that for some reason or other the products of such ductless glands, whose importance is so frequently under-estimated, has been disturbed and is influencing reproduction? These are factors which may particularly apply to those mares which come regularly into season and take service but fail to become pregnant.

Then we come to the question of bacterial infection. I am sorry to say that although this appears to be a very likely cause of numerous cases, comparatively little attention has been paid to it in this country. As Captain Gunning has mentioned, the only serious effort really to elucidate this problem was made by Dr. Dimock, of Kentucky, and were it not for his published observations I should have very little to say on this subject.

In cattle, there is no doubt that sterility occurs apart from contagious abortion and the same state of affairs seems to apply to the mare. I must point out, however, that there is evidence to show that an appreciable percentage of cases of equine abortion is due to an organism which, if not identical with, is very closely related to, the suggested cause of many cases of sterility, that is a streptococcus. There are several strains of streptococci which are unrelated, *e.g.*, the streptococcus of equine strangles and the streptococcus of bovine mastitis, not to mention other strains associated with such diseases as scarlet fever, sore throat and rheumatism in man. In the case of equine abortion one authority states that he has isolated a streptococcus from several cases. Another investigator studying sterility states that he also has isolated a streptococcus in this disease. But we are still without any authoritative information as to whether they are one and the same organism or not. I am inclined to think that they might be and this is one of the points which I should like to clear up. I am going to assume, but remember it is only an assumption, that the same streptococcus is responsible for some cases of abortion and sterility. In relation to this I should like to add that a streptococcus has also been isolated in many instances from foals born dead and those which have succumbed within a few weeks of birth. This seems to suggest that there is a very close relation between all these conditions and I think you will agree with me, in the light of what I am going to say concerning the time and manner of infection, that this is very feasible. Although I am associating some cases of sterility with some cases of abortion, please remember that I am neither referring to sterility as a whole nor to all cases of abortion. In the case of abortion there are other well-recognised causes which do not, apparently, lead to sterility. To-night, I wish to refer to those cases of sterility which are apparently due to the streptococcus.

First of all, let me say that there is evidence to show that the uterus of the healthy barren mare is very resistant to streptococcal invasion, but between foaling and the termination of the first œstral period following foaling the uterus is very prone and susceptible to infection and this, according to our present conception, appears to be the time when infection occurs. How then, and when, does infection take place? Briefly, it appears to be this. You have a history of a normal pregnancy and the mare gives birth to a healthy foal. The foal makes excellent progress and is normal, but the mare may have been injured slightly or assistance may have been necessary and infection introduced. It may be introduced from contaminated surroundings, that is, the foaling box may be harbouring infection from a previous case, etc. There are a number of probable sources of infection and I do not propose to enlarge on them, but I do wish to emphasise that this is the time when most care is necessary. Do not think because foaling is normal that all is well—lack of attention and of scrupulous cleanliness will only lead to infection and later trouble. Assuming, then, that infection takes place at this time, what happens? The microbe gets to the uterus, establishes itself there, causes metritis or inflammation of the uterus, and sterility results.

Supposing now that infection takes place not at foaling but between foaling and œstrus. The results depend on the exact time of infection. If it occurs during heat or even during service from the stallion then obviously the infection has not got sufficient foothold in the uterus to prevent conception and the development of the fœtus. But as the fœtus grows, so does the organism multiply until it may be sufficient to kill the foal before birth and abortion may follow or a dead foal results. In this connection I think that every mare that goes past four to five weeks must be regarded as having been in foal although her abortion may not have been observed or identified. If infection is less marked, the foal may be born normally, only to die within a few weeks. So you lose the foal. But this is not the end of the story. The mare's uterus is still infected and sterility results. Not only that, but efforts to serve her infect the male and the male may in this way transmit infection to other mares. So the story goes on, infection multiplying rapidly with a history of sterility, abortion and the birth of dead or weakling foals.

How do we know, and how are we able to say that an organism such as the streptococcus is responsible? This is done by examining bacteriologically the uterine discharges, dead foals, etc. This material, of course, would be collected by your veterinary surgeon, who must take every precaution possible to avoid contamination. In quite a large number of cases a streptococcus has been identified but in many other cases nothing has been found. Are these negative cases due to causes other than bacteria? Are they the result of incorrect feeding, vitamin deficiencies, etc.? That is the problem. It must be remembered, however, that although bacteriologists may fail to isolate an organism that is no criterion that it is not there, as it is not always easy to get at the source of the trouble: the uterus may be full of discharge and yet it is almost impossible to get at it. Still another explanation may be that infection may have extended up the Fallopian tubes and thus prevented the downward passage of the ova. The healing changes after metritis have also occluded the entrance of the duct of the uterus.

That is as far as available knowledge permits me to go at present and it is along those lines that I am directing my thoughts in my leisure moments. At the present time, as I have in-

formed you, I am trying to ascertain the frequency of streptococcal infection. When, and if, this is established I shall try and determine the specific type and whether it is possible by means of a simple blood test to determine the presence of infection in mares. If this is possible, then the possibility arises of being able to attempt treatment by vaccination.

Although a successful method of treatment would be a great boon, one must not forget that prevention is better than cure and to attain this, scrupulous attention should be paid to hygiene. Keep your stables, drains, gears, cleaning tackle and attendants clean. Absolute cleanliness at all times, and particularly at foaling, treatment of injuries, and the washing of the male genital organs after each service are essential, and if these precautions were more scrupulously carried out, there would be a very appreciable improvement in the position.

In conclusion, however, I must point out that I am now only conducting a preliminary investigation and if this shows promising results, the department in which I have the pleasure of working may be prevailed upon to take up the question seriously. There is not the slightest doubt that little progress can and will be made in dealing with this problem until serious persistent research is commenced and in this the wholehearted co-operation of research workers, veterinary practitioners and breeders is essential. In the meantime, I want to collect as much information as possible concerning the breeding histories of affected mares and in the course of the discussion shall welcome any observations or criticisms in this direction. Please do not imagine that the finding of an organism or infection, should anyone be able to establish its association with sterility, will solve all your sterility problems, as, to my mind, there is more than one factor responsible, although the bacterial may be the most important. Sterility is only a symptom and is common to many diseases, streptococcus infection being only one.

ARMY VETERINARY SERVICE

Among the appointments recently made by the Commander-in-Chief in India is that of Captain J. S. Kingston, R.A.V.C., as Veterinary Officer at the Equitation School in Saugor.

* * * * *

A VETERAN ICELAND PONY

The Iceland pony gelding, aged 42 years, whose photograph is reproduced in the current issue of *The Scottish Farmer*, is in the possession of Mrs. John Gardiner, West Enoch, Maybole. Until twelve years ago he was the property of John Gardiner, Abbey Mill, Maybole, and he has been in the possession of the family for 40 years, having been bought as a two-year-old. The pony worked on the land, and was regularly driven in a light spring cart to Maybole and to Ayr market, a distance of eleven miles, every week, and up to twelve years ago was a familiar figure on the roads. "Donald" has maintained a perfectly clean bill of health, and "retains all his faculties"; his limbs to-day are as clean and sound as those of a three-year-old. "He is an ideal type of a miniature draught horse," says *The Scottish Farmer*. "Few cart-horses are proportionately so well built nowadays."

THE EXPERIMENT WITH SPAHLINGER VACCINE IN NORTHERN IRELAND

Observations by the Joint Committee on Tuberculosis of the Medical Research Council and the Agricultural Research Council

Observations on experiments made by the Government of Northern Ireland to determine the value of Mr. Spahlinger's vaccine in the prevention of tuberculosis in cattle are contained in an official paper issued on Tuesday last (Stationery Office, price 2d.) by the Joint Committee on Tuberculosis of the Medical Research Council and the Agricultural Research Council. The report on these experiments, issued by the Government of Northern Ireland, was summarised and reviewed in *The Veterinary Record* of October 5th (No. xl., of Vol. xv.).

The experiments were carried out in conjunction with Mr. Spahlinger by three veterinary surgeons on the staff of the Ministry of Agriculture of Northern Ireland. Thirty-two calves were used, aged four to six months. Of these 18 were from a tuberculin-tested herd of Aberdeen Angus-Galloway cows and 14 from Grade A tuberculin-tested herds. The statement proceeds: "Two of the calves were used for a preliminary estimation of the activity of the cultures of tubercle bacillus used for the test dose, leaving 30 for the experiments. Eleven were vaccinated with Mr. Spahlinger's 'new simplified vaccine' and seven were kept unvaccinated as controls. These 18 were used in the main experiment. The remaining 12 were vaccinated with four other vaccines, but since in this case the groups were small, the value of the vaccines not regarded as certain and the results irregular, the results have not been included in this short summary.

"The eleven calves vaccinated with the 'new simplified vaccine' were divided into four sub-groups of three or two each, which received the vaccine in different ways (intravenously, intramuscularly and subcutaneously) and in the sub-groups each calf received a different sized dose of vaccine. All the eleven vaccinated calves and the seven unvaccinated controls were given the same dose of virulent tubercle bacilli intravenously six months after vaccination.

"The difference in the effect on the two groups was striking. Of the seven controls five died of acute tuberculosis within 25 to 73 days; the remaining two survived in good condition until slaughtered on the 763rd and 879th day after the test dose. On the other hand none of the eleven vaccinated animals died from the acute form of the disease, and only one died as early as the 607th day, on which date one died with widespread tuberculosis. The remaining ten vaccinated animals lived until slaughtered on the 783rd-890th day. Of these

last, nine were in good condition and one in poor condition.

"All the 18 animals were examined *post-mortem*, and all were found to be tuberculous to a greater or less extent. One of the ten vaccinated which came to slaughter had a tuberculous udder. In all the 13 animals which survived to the 607th day, or longer, living tubercle bacilli were found *post-mortem*, except in one of the vaccinated animals, in which the test for living bacilli was unsatisfactory.

"The amount of disease and its apparent activity found *post-mortem* were varied, and the two control animals slaughtered on the 763rd and 879th days were not very different in this respect from the ten vaccinated, which were slaughtered between the 780th and 829th days."

Comments

Following are the comments of the Joint Committee:—

"In general, the numbers of animals were not enough to give statistically conclusive results.

"In detail various points arise:—

"(1) Since the calves were not tested with tuberculin before the experiment, it is not possible to be certain that none of them were infected at that time.

"(2) The test dose was larger but less virulent than that used in some other experiments, with which this one might otherwise have been compared.

"(3) There is no record of any local or general reaction following the vaccination.

"(4) Mr. Spahlinger states it to be an essential feature of his vaccine that it is a "dead" vaccine, but no statement is made about tests used to ensure that the vaccine used in these experiments contained no living bacilli.

"(5) It is not stated what tests Mr. Spahlinger applied to ascertain and compare the value of the different batches of vaccine manufactured.

"Finally, we consider that more information is required concerning Mr. Spahlinger's system of vaccination before the method could be introduced into practical farming. Besides the need for experience in preparing and testing the vaccine before use, experiments would be required to determine (*a*) whether the tuberculin test interferes with vaccination, as suggested by Mr. Spahlinger, (*b*) the best dose of vaccine and the best manner of vaccination, (*c*) the most suitable age for vaccination; how early in life it is safe to vaccinate a calf, (*d*) the time after vaccination at which immunity appears and how long it lasts, (*e*) the persistence of immunity in animals exposed once or repeatedly to infection by natural means, especially whether vaccination early in life would protect under farming conditions at an age when heifers must join the herd, *i.e.*, when they calve for the first time, (*f*) whether natural exposure to infection, as opposed to an intravenous test dose, would result in only mild or negligible infection, as has been suggested."

Conclusions

The Joint Committee reaches the following conclusions:—

"1. A case has been made out for further investigation, and we are of opinion that a thorough test should be made in this country, if Mr. Spahlinger is found willing to supply vaccine in sufficient quantity for the inoculation of a suitable series of animals.

"2. We would urge that until the vaccine has been shown by further and extended experiments to be effective against natural as well as experimental methods of infection its practical application should be deferred, and we would deprecate most strongly its enforced general use until a thorough investigation has been made."

. . . . . .

[The following signatories constitute the Agricultural Research Council's Committee on Tuberculosis (jointly with the Medical Research Council): Dr. J. A. Arkwright (Chairman), Sir Merrik Burrell, Professor J. B. Buxton, Professor S. L. Cummins, Captain S. R. Douglas, Major G. W. Dunkin (Joint Secretary), Dr. A. Stanley Griffith and Dr. N. F. Smith (Joint Secretary).]

Clinical Communication

CASE OF TUBERCULOSIS (BOVINE TYPE) IN A SHEEP IN IRELAND

J. M. MURPHY, M.R.C.V.S., D.V.S.M.
Assistant Veterinary Inspector,
Dublin Corporation

[The primary reason for recording this case is that (so far as I am aware) it is the first case of tuberculosis in a sheep that has ever been confirmed in Ireland.]

. . . . . .

On December 10th, 1934, I inspected the carcase of a sheep which had just been slaughtered at a city slaughterhouse.

The carcase was that of a cross-bred ewe about four years old and in *good condition*. The ewe was pregnant.

The following lesions were found:—

Lungs. — Several caseo-calcareous lesions throughout the substance of both lungs varying in size up to that of a large marble.

Liver.—Nothing abnormal (save for lesion in portal gland).

Spleen.—Large caseo-calcareous lesion in substance, the size of two fists, also two smaller caseating lesions the size of hazel nuts.

Udder.—Large calcareous lesion the size of a hen's egg.

There were caseating lesions in the following lymphatic glands: bronchial, mediastinal, portal, one supramammary, both iliacs, one sublumbar, one renal and one inferior cervical.

The carcase was seized as being unsound and unfit for the food of man.

The majority of the lesions were submitted to Professor Kearney, of the Veterinary College, Ballsbridge, to whom I am indebted for the confirmation and classification.

This sheep was purchased from a dealer in Dublin Cattle Market on the previous Thursday. The following week enquiries were made at the market with a view to tracing the animal. Unfortunately the dealer could not remember where he had purchased this particular sheep as he had sold on that day several lots which had been bought at different fairs.

The following is Professor Kearney's report:—

"The outstanding gross feature of the lesions as a whole, was the advanced state of fibrosis and calcification: this was particularly noticeable in the mammary lesion.

"The histology revealed great fibrous proliferation with multiple foci of necrosis and calcification. Acid-fast round bodies were relatively frequent, while bacillary forms of *M. tuberculosis* were rare.

"The results of the biological test with the organism were as follows:—

"Following the subcutaneous inoculation of a guinea-pig and a rabbit with an emulsion of the lesions, the guinea-pig died of tuberculosis on the 69th day and the rabbit on the 77th day. In both animals there were extensive lesions of tuberculosis accompanied by emaciation: nothing else was found. A fowl which was inoculated with the same material unfortunately contracted an intercurrent infection from which it died on the 62nd day after inoculation, but there was no evidence that it had been infected by the inoculum.

"The cultural characters of the organisms were not studied but from the biological test I am of the opinion that the organism was the bovine type of *M. tuberculosis*.

"The noteworthy feature of this case was the extensive distribution of the lesions without any obvious systemic disturbance."

"The transference of phosphorus from the fields of the country to the drains of the town must sooner or later end in ruin. The quality of all vegetable food will slowly decline; though, before this seriously affects human nutrition, it seems possible that a reduced and fluctuating quantity of food, accompanied by an increased mortality among domesticated animals, may drive home the warning. Drought, no doubt, will at first be blamed, whereas the real fault will lie in the land's reduced capacity to withstand it. Phosphorus shortage, then, is a rock which may wreck the mechanised multiple plough."—*Dr. J. R. de la Marett.*

Abstracts

[**"Stiff Lamb" Investigations.** *Preliminary Report.* Lee, A. M., and Scrivner, L. H. (1935.) *J. Amer. Vet. Med. Ass.* **86.** 5. 644-655.]

Sheep raisers in Wyoming have for a number of years had losses from a condition called "stiff lambs." The investigation described was carried out in the spring of 1932 when 15 per cent. of many flocks were affected. Outbreaks were limited to farms where shed-lambing was practised and sheepmen had found the trouble could be minimised by later lambing. The symptoms are stilted gait due to stiffening of the leg muscles, accompanied often by swollen joints. The temperature is normal and the appetite good.

Typical white lesions were found in the skeletal muscles and small abscesses occurred in the heart and kidneys. Generally purulent arthritis was present in the swollen joints. Fibroplastic tissue occurred in the white lesions and frequently the sarcolemma of the muscle fibres was ruptured, and deposits of hæmatoxylin-staining substances, probably mineral salts, were found in these ruptured fibres. Chemical analysis of the white muscle lesions showed there to be 22 times as much calcium and four times as much phosphorus as in normal muscle. Cultures were obtained when large quantities of fresh blood were used. Three organisms were isolated:—

(1) Short, bi-polar, Gram-negative, non-sporing rods.

(2) Long, Gram-negative, non-sporing, non-bi-polar rods.

(3) Gram-positive cocci.

When cultures were inoculated intravenously into lambs, rabbits and guinea-pigs (1), (2) and (3) generally caused death and frequently pus was found in the joints. Organisms (1) and (3) often gave rise to white muscle lesions.

Reference is made to work on outbreaks in other districts attributed by various authors to "white muscle" disease or to specific or non-specific arthritis. Faulty nutrition has been suggested as a cause, but it can be excluded here since the condition arose under a variety of diets and, moreover, never more than one of twin lambs was affected. A correlation is shown between the time of birth, docking or castration and the onset of symptoms. The authors conclude that in Wyoming "stiff lambs" is due to infection of the navel and castration or docking wounds with any of the above three micro-organisms.

W. L. S.

[**Epizoötic Tick-borne Tularæmia in Sheep in Montana.** Philip, C. B., Jellison, W. L., and Wilkins, H. F. (1935.) *J. Amer. Vet. Med. Ass.* **39.** 6. 726-744.]

Although tularæmia is a disease apparently confined to the United States of America, it is of general interest as an example of a tick-borne bacterial disease, and the above article records an explosive outbreak among sheep in Montana. About 40 per cent. of the flock (1,320 yearling ewes) became affected within 24 days and altogether 200 died before the disease subsided. The symptoms were dejection, stiffness, dullness, inappetence, elevated temperature and frequently diarrhœa. Later the breathing became laboured and prostration and death followed. Paralysis was absent in all but one case where there may have been complications. Lung involvement was an almost constant finding at autopsy.

That tularæmia was largely responsible for the outbreak was indicated by the following facts: (1) The disease was observed eight to ten days after the flock arrived at Quail ranch, where there was an unusually heavy infestation of the wood tick (*Dermacentor andersoni*) on rabbits and squirrels. The sheep were also severely infested. (2) *B. tularense* was recovered from the tissues of five affected sheep and also from dead jack rabbits. (3) Recovery of the micro-organism from twelve out of 19 samples of ticks from infected sheep. (4) Blood serum from affected and recovered sheep agglutinated *B. tularense* in titres as high as 1 : 2,560. As indicative of the affinity of this organism with Brucella, it is of interest to note that all samples of serum were tested for *Br. abortus* agglutinins, and they mostly showed a high degree of cross-agglutination. In view of the prevalence of tularæmia infection in sheep, rodents and in ticks, the authors were puzzled that no human beings became affected.

W. L. S.

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[**Diagnostic Injections into Joints and Tendon Sheaths in Lamenesses.** Westhues, Dr. (1934.) *Deuts. tierärztl. Wschr.* **42.** 52. 829-832.]

The author describes the injection of local anæsthetics into joints and tendon sheaths, as an aid to the diagnosis of lameness in the horse.

The sites of the injections are as follows:—

(1) Pedal Joint.—The site lies anterior to the foot, 2 cms. above the coronet, and 2 cms. on either side of the mid-line. The needle is inserted through the skin and is pushed downwards and towards the mid-line until synovia runs out. The point should then lie 1-4 cms. underneath the extensor pedis tendon. If synovia fails to escape the needle is partially withdrawn and is inserted in a different direction.

(2) Pastern Joint.—With finger and thumb the lateral and medial distal condyles of the second phalanx are located. The site is on a level with a point a thumb's breadth above the lower end of the condyles, and a finger's breadth on either side of the mid-line, on the anterior surface of the foot. The needle is pushed through the skin in a downward direction and towards the mid-line for a distance of about 4 cms., until the bone is reached and synovia escapes.

(3) Fetlock Joint.—The site lies a finger's breadth below the external small metacarpal, in the triangle formed by the large and small metacarpal bone and the suspensory ligament. The needle is inserted horizontally and is then given a slightly backward and downward direction, until its point lies in the mid-line and synovia escapes.

(4) Carpal Joint.—The site lies directly above the os pisiformis, in the hollow between the radius and the flexor carpi externus. The needle is inserted horizontally to a depth of 2-4 cms., until synovia escapes. The anæsthetic affects the upper carpal joint.

(5) Elbow.—A good hand's breadth below the olecranon the upper edge of the lateral tuberosity of the radius can be felt. The condyle of the humerus lies 2-3 cms. above. The needle is inserted midway between these two points and is pushed inwards and slightly downwards until synovia escapes.

(6) Shoulder Joint.—The site lies on the anterior edge of the infraspinatus muscle, a finger's breadth above the convexity of the external tuberosity of the humerus. Here the tendon of the infraspinatus is distinguishable as a strand the breadth of one's thumb. The needle is inserted horizontally 5-10 cms. deep, until it touches the articular cartilage or synovia runs out.

(7) Tarsus.—The injection is made at the height of the internal malleolus and 2-3 fingers' breadth from it on the anterior surface of the joint. The needle is inserted horizontally, to a depth of 1-3 cms.

(8) Stifle: (*a*) *Femoro-tibial articulation.*—The external tuberosity of the tibia, and the condyle of the femur are sought and recognised as sharp prominences lying on the dorso-lateral aspect of the second thigh. Between these prominences can be felt the common tendon of the peroneus tertius (tendinous portion of the flexor metatarsi) and the extensor pedis, the bursa of which is a pouch connected with the femoro-tibial capsule. A 6-8 cm. needle is inserted on the anterior or posterior edge of this tendon, and is directed slightly upwards until the bone is reached, then along the bone, until synovia escapes.

(*b*) *Patellar joint.*—The injection is made between the external and middle patellar liga-

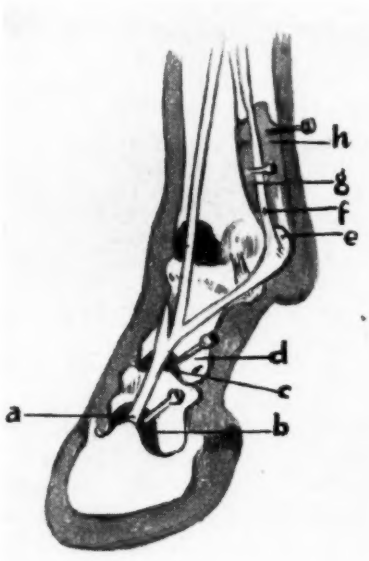

Fig. I.

Fig. I.—Diagnostic Injection into the Phalangeal Articulations and the Tendon Sheath of the Flexors of the Fetlock.

(*a*) Tendon of extensor pedis.
(*b*) Capsule of pedal joint.
(*c*) Capsule of pastern joint.
(*d*) External condyle of the distal end of the second phalanx.
(*e*) Sesamoid bone.
(*f*) Suspensory ligament.
(*g*) Capsule of fetlock joint.
(*h*) Sheath of flexors of fetlock.

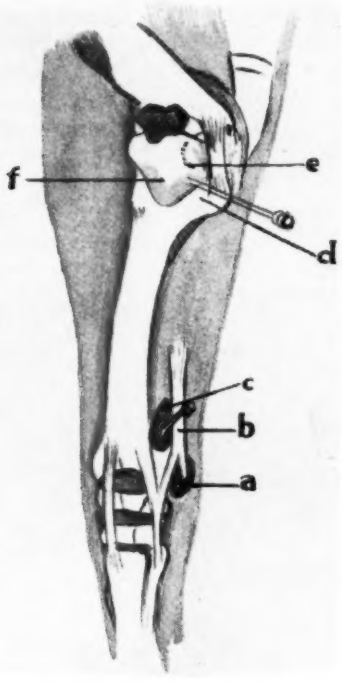

Fig. II.

Fig. II.

(*a*) Sheath of flexor metacarpi externus.
(*b*) Tendon of flexor metacarpi externus.
(*c*) Capsule of carpal joint.
(*d*) External tuberosity of radius.
(*e*) External condyle of humerus.
(*f*) Capsule of elbow joint.

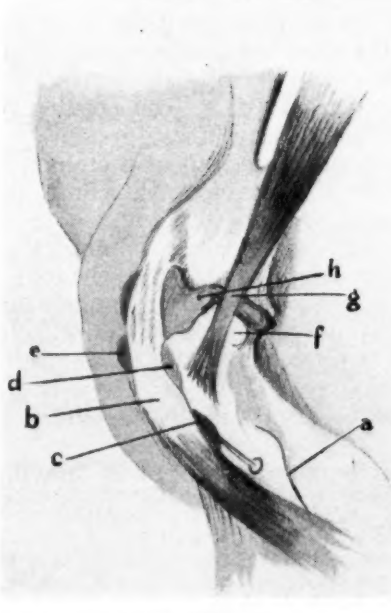

Fig. III.

Fig. III.—Shoulder Joint.

(*a*) Deltoid tubercle.
(*b*) Biceps muscle.
(*c*) Bursa intertubercularis.
(*d*) Lateral (external) tuberosity.
(*e*) Middle tuberosity.
(*f*) Crest of external tuberosity.
(*g*) Infraspinatus tendon.
(*h*) Capsule of shoulder joint.

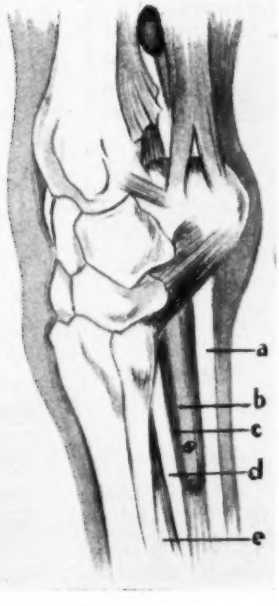

Fig. IV.

Fig. IV.—Carpal Joint.

(*a*) Superficial flexor.
(*b*) Deep flexor.
(*c*) Carpal sheath.
(*d*) Check ligament of deep flexor.
(*e*) Suspensory ligament.

ments. The needle is inserted horizontally and 2-6 cms. deep, until synovia runs out. The anæsthetic spreads also into the internal half of the femoro-tibial joint, since the two synovial sacs communicate in most cases.

(9) Hip Joint.—The needle must be 10 cms. long, and injection is made horizontally at the anterior edge of the great trochanter, directly above the third trochanter. The point of the needle encounters the neck of the femur and is directed upwards until it strikes cartilage or synovia escapes.

(10) Common Sheath of the Flexors of the Fetlock.—The site is 5 cms. dorsal to the sesamoid bones, on the external aspect, between the suspensory ligament and the deep flexor tendon. The needle is inserted horizontally.

(11) Carpal Sheath.—The site lies on the external side, in the upper third of the region posterior to the metacarpals, in the angle between the deep flexor tendon and the check ligament. The injection is made horizontally and 1-2 cms. deep.

(12) Bursa Intertubercularis.—A 10 cm.-

long needle is inserted at the level of the upper end of the deltoid tubercle of the humerus, between the latter and the external surface of the biceps muscle, and is directed slantingly upwards on to the bone and then along the bone underneath the biceps tendon, until synovia escapes.

(13) Tendon Sheath of the Long Digital Flexor of the Hind-limb (medial head of deep digital flexor).—On the internal aspect of the tarsus, the tendon of the long digital flexor can be felt lying in the groove of the calcaneus, about a hand's breadth below the point of the hock. The needle is directed slantingly from above downwards, or from below upwards, to the posterior edge of the tendon and then along it until synovia escapes.

. . . . .

Before injecting, the sites are clipped and thoroughly disinfected. The use of a twitch or the lifting of a fore foot is the method of restraint employed.

The injection has been made into the stifle joint of a few dogs and cattle. One injection only is necessary in these animals (near the patellar ligament).

Although novocain is well known to be a poor anæsthetic for a surface, it is the one employed by the writers. Ten to 20 c.cs. of 4 per cent. novocain, with adrenalin, is injected according to the capacity of the synovial sac. Anæsthesia is complete in 20 to 30 minutes and remains for two to three hours.

Complete sterilisation of the syringe and needle is essential. In 132 cases only one showed any kind of swelling after the injection. This was the case of a racehorse with lameness of three-quarters-of-a-year's duration. Following the injection of 20 c.cs. of novocain into the carpal sheath the lameness ceased temporarily. In the sheath occurred a painful swelling, which disappeared in four weeks, and with it the lameness.

Some increase of lameness is to be expected for one to two days after the injection, owing to the increased use of the limb during the period of anæsthesia. E. W. A.

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[Dental Prosthetics in the Horse. Becker, E. (1935.) *Deuts. tierärztl. Wschr.* **43.** 1. 1-5. (11 illustrations.)]

The author has performed filling operations in 356 dental cases in the horse. His results were good—the fillings remained firm and wore well. He uses an electric borer with human type drills.

The indications and technique are as follows:—

(1) Hypoplasia of the central cement of the molars, *i.e.*, imperfect development of the cement within the central enamel ring. The cement wears rapidly, so that a hole is formed, in which food accumulates. Caries and its sequelæ may occur.

The procedure consists of the boring out of the hole, its disinfection and the filling with a copper amalgam. Small holes can be stopped immediately, but deep ones should be plugged with cotton-wool soaked in disinfectant and left for a few days. The wool is then removed and the permanent stopping is put in, on top of some disinfectant paste. The drilling of circular grooves on the inner wall of the hole gives additional security, and is advised.

(2) Hypoplasia of the central cement in the anterior portion of the first upper premolar.

The cement extends downwards for a short distance only. In consequence of the natural wear of the tooth, the bottom of this column of cement is soon reached, and the non-durable dentine is exposed. A hole is bored in the dentine, and another in the central cement of the posterior part of the tooth. The two holes are connected by a groove.

Warm plastic wax is pressed into the cavities and then cooled by cold water. The wax hardens and forms a negative of the boring. It is lifted out of the tooth by a metal point, and several needles are pushed lightly into its exposed surface. The whole is then placed in a "cast ring," the cast being suspended by the needles. "Bedding-in mixture" is poured into the cast ring, and it solidifies. The needles are withdrawn and the hardened mass is heated, so that the wax melts and runs out of the channels left by the needles. A space is thus left, and this forms a mould for the stopping.

The metal to be used for the stopping is put on top of the cast ring, and strongly heated so that it melts and runs down the channels into the space. After the metal has cooled and solidified, the mould is broken and the cast is taken out, cleaned and fixed in the tooth with the same fixing material as is used in human dentistry.

(3) Spaces between individual teeth, in which food accumulates, resulting in paradontal disease.

The treatment consists of boring into the cement of the two adjacent teeth and connecting them by a bridge of metal, which thus obliterates the intervening space. To prepare so large a cast an indirect method is advised, although the method used under heading (2) may be employed. Wax is pressed over the two teeth and into the space, so forming a negative. Using it as a mould, a plaster of Paris model of the teeth is prepared. The stopping is then prepared from the model in exactly the same way as described under heading (2).

(4) Small traumatic defects.

When the pulp is exposed, the tooth should be extracted. Otherwise it is filled with a metal or amalgam stopping.

The illustrations are so excellent as to be clear to any reader who is unable to read German. E. W. A.

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[A "Sucking Habit" of the Horses of Brittany. Robin, V. (1935.) *Rec. Méd. vét.* **3.** 2. 65-70.]

One quarter of the foals in Brittany have a peculiar sucking habit, which is much more common in males than in females.

It is believed to be caused by their irrational rearing—early weaning at two to three months of age and feeding on unsuitable food consisting of a mash of cooked turnips, potatoes and beet-roots, with bran or flour.

Shortly after the beginning of a meal, ingestion ceases and the foal begins a curious performance. The lips are stiffened, the tongue protruded, the intermaxillary region moves in and out, and a sucking noise is heard. This continues for a few seconds or a minute and is repeated at intervals until the meal is finished. A few foals continue for half-an-hour after the meal, while others do it only during the succeeding ten minutes. It does not occur after a meal of hay.

Nothing is swallowed while the performance lasts. The habit has no influence on the health of the subject, which is never blown or flatulent.

The habit usually disappears by the time the foal is a year old, but exceptionally it remains for a lifetime. A few veterinarians have observed the habit to begin in horses of three years of age.

The habit cannot be considered a form of wind-sucking—air is not swallowed and the flexion and extension of the neck is lacking. The legal definition of wind-sucking, unfortunately, does not exclude it. E. W. A.

IRISH FREE STATE MEDICAL RESEARCH COUNCIL

The *Irish Times* announces the formation of a Medical Research Council for the supervision of medical research in the Free State. The new council will be composed of nine members, consisting of one member each from the following bodies: The National University of Ireland, University College, Dublin, University College, Cork, University College, Galway, Trinity College, Dublin, the Royal College of Physicians in Ireland, the Royal College of Surgeons, and the Royal Academy of Medicine in Ireland, with an independent chairman to be appointed by the Government.

The council has been approved by the Government, which proposes to allocate a sum of not more than £10,000 from the funds of the Hospitals Trust, Limited, for its first year's working. The council's first care, it is announced, will be the promotion of clinical research in medicine and dentistry. Where it is desirable, research work in veterinary fields will be financed, and it is hoped that close co-operation will be maintained between the council and the Department of Local Government.

Report

WORK OF THE EDUCATIONAL AND RESEARCH DIVISION OF THE MINISTRY OF AGRICULTURE AND FISHERIES FOR THE YEAR 1933-34

II. Agricultural Education

Part I of this report, dealing with Agricultural Research (including Local Investigation and Advisory Work) appeared in the October issue of the Ministry's Journal.

This report (published in the November issue) relates, so far as concerns agricultural education provided by local authorities, to the second complete year (April, 1933, to March, 1934). In agricultural education administered by local authorities the principal measure was the reduction, as from October 1st, 1931, of grants in aid of maintenance expenditure to the uniform rate of 60 per cent. and local authorities were informed that only in very exceptional circumstances would funds be available to aid fresh developments. In 1932-33 a sum of approximately £40,000 was saved by local authorities. This saving, spread over the counties of England and Wales, represented small economies such as less travelling, fewer advisory visits, in some instances the loss of a member of the staff or a part-time instructor, but not generally the loss of any essential service. It nevertheless remains true that in 1933-34 much useful work was held up, and it is difficult to contemplate that the service can remain indefinitely on its present restricted level. The maintenance grants paid to agricultural colleges and university departments of agriculture remained almost unchanged. An increased grant of £500 (total £5,800) was paid to Reading University in aid of the new Chair of Horticulture, and as a temporary measure the grant to the Midland Agricultural College was reduced by £600 to £2,250. The year 1933-34 was the last year of maintenance grants at the old level; for 1934-35 and subsequent years they have been re-assessed. It is gratifying to note that the numbers of students at these institutions in 1933-34 were higher than for some years past.

A. — Higher Agricultural Education at Universities and Agricultural Colleges

(i) *Maintenance Grants.*—On balance, the maintenance grants paid to agricultural colleges and university departments of agriculture showed a reduction of £100 on last year, *viz.*, £53,350 in 1933-34 as against £53,450 in 1932-33.

(ii) *Capital Grants.*—The Ministry's commit-

ments in respect of capital development in 1933-34 were only £483. A sum of £333 was paid to Reading University towards the provision of a horticultural laboratory: the remaining £150 was a grant to Wye College in aid of interest charges incurred on a loan for the acquisition of the College farm.

(iii) *Students.*—The number of students in attendance at institutions for higher agricultural (including veterinary) education during 1933-34 was 2,250, as compared with 1,994 in 1932-33. Apart from the attendance at regular courses, that at occasional or miscellaneous courses at agricultural colleges, etc, showed a decided increase.

B. Agricultural Education provided by Local Authorities

(i) *Maintenance Expenditure.* — The total expenditure for the year 1933-34 amounted to £323,721 as compared with £329,230 in 1932-33, and grants to meet this were £190,661 in 1933-34 as compared with £192,299 in 1932-33. In 1933-34 there was a slight rise in expenditure in Wales, but this was offset by the decline—not, however, very substantial—in the expenditure on agricultural education in England.

(ii) *Capital Expenditure.*—The only grant-in-aid made to local authorities during the year was a grant of £712 to the Monmouth County Council towards the cost of completing the new women's hostel at Usk Farm Institute.

(iii) *Courses of Instruction.*—Of 22,198 students who received some form of instruction in 1933-34, over one quarter were women, who were mainly taking courses in dairying, poultry keeping and rural domestic economy.

(iv) *Scholarships.*—During the year under review 1,222 agricultural scholarships were awarded by local authorities, the total cost involved being £21,500.

(v) *Staff and their Advisory Work.*—Of the 62 administrative counties in England and Wales, 4 (Hunts, Isle of Ely, Isles of Scilly and Soke of Peterborough) do not employ agricultural organisers. In the remaining 58 counties, 54 organisers are employed. The total number of full-time instructors is 358. Many part-time instructors in the various subjects are employed in addition to full-time instructors. There is no doubt that further increases in staff will be required in the near future, if an adequate advisory service is to be maintained.

C. Dairying

The most notable event in the dairy industry in 1933-34 was the establishment of the Milk Marketing Board, which became responsible for all sales of milk other than certain classes of designated milk, as from October 1st, 1933. The Board proposed to bring into effect a scheme for the encouragement of clean milk production without delay, and in the meantime the educational work that the Ministry had hitherto prosecuted in this direction was continued.

Courses of Instruction.—The number of students who were taking regular courses in dairying at agricultural colleges and farm institutes during 1933-34 was 732, *i.e.*, 192 at agricultural colleges and 540 at farm institutes; the previous year's total was 1,058. While complete returns of the number of persons who attended decentralised lectures and demonstrations are not available, there is reason to believe that the figures are not substantially below those of last year, *viz.*, 43,000.

Clean Milk Production.—The Ministry has made efforts for some 13 seasons to stimulate the production of clean milk through the organisation of clean milk competitions in the counties, and in all the important dairy districts such competitions have formed a regular feature of county educational schemes. During the past 13 years approximately 6,000 dairy farmers have taken part in these competitions. A general knowledge of the methods employed and the standards to be aimed at spreads throughout the country and has an indirect, but appreciable, influence in improving the quality of the milk produced.

County Registers of Accredited Producers.—For dairy farmers who have passed through a clean milk competition and who require some organised means to enable them to maintain their standard of production, county registers of accredited producers were instituted. Briefly, the scheme provided for the registration of producers who had obtained 66⅔ per cent. of the marks available in a county clean milk competition of six months' duration. A producer who failed to conform with the standard in three consecutive months was suspended from the register until such time as he submitted three consecutive satisfactory samples. This scheme may be regarded as a first attempt at something on the lines of the Milk Marketing Board's scheme for a Roll of Accredited Producers, by which it has now been superseded.

Advisory Schemes.—An advisory service that includes the bacteriological examination of milk samples is available in 23 counties for licensed producers of designated milks.

Courses for Sanitary Inspectors. — Four courses were held in 1933-34, much below the previous year's record.

Milk Control Exhibit.—During the year, an exhibit on methods of clean milk production, the hygienic handling of milk, etc., was, at the request of local educational authorities, shown at a number of agricultural and public health exhibitions throughout the country.

D. Poultry and Small Livestock

Instruction and Advisory Services.—Courses of instruction in poultry husbandry at agricultural colleges may be of one or two years' duration, and conform generally to the standard required for the National Diploma in Poultry Husbandry. The number of students who took the advanced courses at the National Institute of Poultry Husbandry in 1933-34 was 32; in the agricultural colleges the poultry students numbered 143, and at farm institutes 445 poultry students were enrolled during the year, making a total of 620. For the assistance of the practising poultry farmer, local authorities have instituted an advisory service through the appointment of county poultry instructors who are available to give advice to all poultry keepers in their area on all points of practical difficulty. During the winter months local lectures on poultry subjects are arranged in nearly all counties.

County Egg-laying Trials.—In 1933-34 trials under the Ministry's scheme were conducted in 39 counties. The number of birds competing was 9,126 in 1933-34 as against 9,105 in the previous season. The average egg production during the season's trials was 177·50 per bird as against 181·87 in 1932-33 (the decrease being due, no doubt, to the heavier toll in mortality which was generally experienced during this period). As mentioned last year, the death rate among high-grade stock has been giving rise to anxiety among poultry breeders for some years past. During the last seven years there has been a steady rise in the percentage of mortality recorded, from 5 per cent. in 2,800 birds in 1927-28 to 13·5 per cent. in 1933-34, when 9,126 birds were entered in the trials.

Accredited Poultry-breeding Stations.—During the season 1933-34, the Accredited Poultry-breeding Station Scheme was in operation in 26 counties. The Ministry has issued model regulations governing the classes of stock that are to be allowed under the scheme, and the conditions as to testing birds for freedom from bacillary white diarrhœa.

Cockerel-breeding Scheme.—This scheme aims at the distribution of approved cockerels bred from first-class hens. It is still in an experimental stage, and the Ministry has not yet found it desirable to issue model regulations.

National Poultry Institute Scheme.—The main work at the National Institute of Poultry Husbandry consisted in the trial of rations to test the value of different constituents. At the Ministry's Veterinary Laboratory, Weybridge, work on tuberculosis in poultry was continued and extended. In addition, the investigation of other diseases, including Newcastle disease, fowl cholera, and coccidiosis has been continued. At the School of Agriculture, Cambridge, work has been continued on the effect produced on the quality of both eggs and carcase by feeding fatty materials, etc. In breeding work on poultry at Cambridge, the study of the inheritance of fecundity has been continued. At the Northern Breeding Station, Reaseheath, a cross-breeding experiment to study the value of the first cross against the pure breed, an attempt to produce a strain of commercial poultry capable of withstanding continuous in-breeding, and a study of the inheritance of fertility of White Wyandottes were continued. Southern Table Poultry Experiments at Wye were mainly concerned with the different methods of conditioning of table birds.

Stud Goat Scheme.—This scheme, the local administration of which is in the hands of the British Goat Society, aims at encouraging the keeping of goats of improved milking quality by small breeders. During 1933-34, goats were stationed at 89 centres approved under the scheme, and the number of premiums awarded was 1,665.

E. Miscellaneous

(i) *Scholarships for Sons and Daughters of Agricultural Workers.*—The main objects of this scheme are to offer to children of agricultural workmen a chance of obtaining a sound technical training in agriculture, and to improve the standard of agricultural production by returning annually to the industry a body of young men and women skilled in the practice of agriculture. Benefits under the scheme fall into three categories, namely, (1) Junior scholarships tenable at farm institutes and similar institutions for courses not exceeding one year; (2) Extended junior scholarships for advanced or specialised courses of instruction, not exceeding one year, at farm institutes or agricultural colleges, and (3) Senior scholarships tenable for degree or diploma courses in agricultural subjects at university departments of agriculture or agricultural colleges, or for courses in veterinary science at veterinary colleges. All awards cover the whole cost of instruction while students are at the training institutions. During the 13 years the scheme has been in operation (1922-34) assistance has been granted to more than 1,400 individuals, involving the award of 1,622 scholarships.

(ii) *Young Farmers' Clubs.*—The Young Farmers' Club movement continued to make satisfactory progress under the guidance of the National Federation. This organisation, though hampered by lack of funds, is of vital importance to the movement as a whole, and ought to be established on a permanently sound financial basis. Towards the end of 1933, the Ministry obtained Treasury sanction to the pay-

N.V.M.A. Divisional Report

LINCOLNSHIRE AND DISTRICT V.M.A.*

MEETING AT LINCOLN

A meeting of the above Association was held at the "Albion" Hotel, Lincoln, on Thursday, October 10th, 1935.

The chair was taken by the President, W. W. Lang, Esq., at 2.30 p.m., and there were also present Mr. Porter Smith, Major Forster, Messrs. Swaby, G. Gibson, E. W. Gibson, H. Walpole and the Hon. Secretary (*pro. tem.*), Mr. F. Leeds Gooch. Mr. E. G. Conisbee, of Kimbolton, was present as a visitor.

The minutes of the last meeting were taken as read.

Apologies for absence were received from Sir F. T. G. Hobday, Messrs. Townsend, Hudson and F. W. Leeds Gooch.

Correspondence was received from the National Veterinary Medical Association and two pamphlets from the National Horse Association.

Provisional Committee.—On the proposition of Mr. Porter Smith, seconded by Mr. G. Gibson, Messrs. W. W. Lang and F. Leeds Gooch were elected to serve on the Provisional Committee of the "National."

Vice-President.—Mr. G. Eaton was elected a Vice-President in the place of Mr. G. Lockwood, who retires in rotation.

Elections to Membership.—The following gentlemen, who had been nominated at the last meeting, were unanimously elected members: Messrs. A. J. James, Peterborough; J. Macdonald, Spilsby; J. A. Shaw, Alford; W. K. Townson, Peterborough; and G. Watkins, Mareham-le-Fen.

* Received for publication November 2nd, 1935.

Royal Sanitary Institute Congress

Mr. F. Leeds Gooch, delegate to the Royal Sanitary Institute Congress, then presented the following report, prefacing his remarks by saying that the report would be short as most of the subject matter had already appeared in detail in the veterinary Press.

Report.—The Congress was held at Bournemouth and the Veterinary Hygiene Section met on Thursday and Friday, July 18th and 19th, the President of the Section being Professor Linton (Edinburgh), the Secretary Lieut.-Colonel Dixon (Leeds), and the Local Secretaries Major Wood and Mr. Fenn Smith.

The President gave a very interesting inaugural address.

On the Thursday morning Mr. Ritchie (Edinburgh) read a paper on "The Milk Supply." A good discussion, opened by Mr. Jordan, Chief Veterinary Officer, Sussex, ensued, in which 13 members took part, but only one veterinary surgeon besides the opener. Some very useful facts and figures were elucidated. There was a very good attendance and the Veterinary Hygiene Section was considered to be the best attended Section in the whole Congress.

On Friday morning Dr. Moran read a paper, "Problems in the Preparation of the Storage of Meat." Dr. Wooldridge opened the discussion, in which eleven took part, including two veterinary surgeons.

The veterinary profession was not well represented in the Section.

The social side of the Congress was quite up to the average. The Mayor invited 200 each day to attend the cricket match, Hampshire *v.* Nottingham, and provided a rest tent, refreshments and tea. On the Friday the President of the Congress (Lord Malmesbury) invited 200 members of the Congress to a drive through the New Forest and to partake of tea at his residence; unfortunately the pleasure of the afternoon was marred by continuous rain.

Finance.—The meeting then resolved itself into committee in order thoroughly to go into the finances of the Association, and the Secretary was instructed to draw up a letter to send to every member of the Association.

Clinical Matters.—Upon the resumption of open meeting the members, by invitation, described some very interesting cases and also exhibited specimens. All present took part in a very interesting and informal instructive conversation.

Benevolence.—The sum of 11s. was collected for the Victoria Veterinary Benevolent Fund.

ment of grant at the rate of £1,200 per annum for a further period of two years. A promise of assistance from the Carnegie United Kingdom Trust was also obtained.

(iii) *Sugar-Beet.*—The beet sugar factories again provided funds for a programme of education and research in sugar-beet cultivation under the control of a committee of representatives of the factories and of the Ministry. The agricultural organisers and factory agriculturalists again collaborated in arranging demonstrations in the different factory areas. These demonstrations covered many aspects of the cultivation of sugar-beet and the use of factory by-products, *e.g.*, seed varieties and seed treatment, effects of various artificial manures, rate and time of manuring, top-dressing, drilling, spacing, plant population, lifting, the use of factory lime sludge, and the value of beet tops and dried beet pulp as feeding-stuffs.

J. M.

At the conclusion of the meeting, at the kind invitation of the President, the members took tea, and a most enjoyable meeting finished on a very happy note.

Major Dalling has kindly consented to read us a paper at our next meeting.

F. L. Gooch, *Secretary, pro. tem.*

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Dec. 7th.—Meeting of the North of England Division, N.V.M.A., at Birtley (demonstration), 2.30 p.m., and Plawsworth (business), 4.30 p.m.

Dec. 9th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4 p.m.

Dec. 9th-20th.—Oral Examinations at Dublin, Glasgow, Edinburgh, Liverpool, London.

Dec. 17th.—Annual General Meeting of the North Midland Division, N.V.M.A., at Sheffield, 4 p.m.

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Jan. 8th.—R.C.V.S. Committee Meetings. V.V.B.F. Council Meeting.

Jan. 9th.—R.C.V.S. Committee Meetings.

Jan. 10th.—R.C.V.S. Committee and Council Meetings.

Sept. 14th-18th.—N.V.M.A. Annual Congress, Scarborough.

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PERSONAL

Appointments.—Mr. Geo. F. Pickering, M.R.C.V.S., D.V.S.M., son of Mr. F. Pickering, M.R.C.V.S., of Long Close, Hexham, has been appointed Chief Veterinary Officer for the County of Northumberland, a newly-established post. For the past three-and-a-half years Mr. Pickering has been Veterinary Officer for East Sussex.

Mr. W. H. Horne, M.R.C.V.S., has been appointed Assistant Veterinary Inspector to the City of Edinburgh.

. . . . .

Forthcoming Marriage.—The engagement is announced of Miss A. M. Catchpole, M.R.C.V.S., of The Tudor House, Hunston, Bury St. Edmunds, and the Reverend W. W. Mumford of Bardwell Rectory, Bury St. Edmunds.

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R.C.V.S. OBITUARY

Soulsby, John, Kirkgate, Cockermouth, Cumberland. Graduated London, July 3rd, 1879; died November 25th, 1935, aged 76 years.

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Sport, business, agriculture and public life were represented at the funeral on Thursday of last week of Mr. John Soulsby, M.R.C.V.S., the Cockermouth veterinary surgeon, who was still in practice at the time of his death on the Monday, having lived 45 years in Cockermouth. Members of the veterinary profession present were Mr. Craig Robinson, Carlisle; Mr. Robert Simpson, County Veterinary Surgeon, Carlisle; Mr. J. Cameron, Assistant County Veterinary Surgeon, Cockermouth, and Mr. F. Hodgson, Brigham.

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DIPLOMA IN VETERINARY STATE MEDICINE

On the results of the Examination held by the Royal College of Veterinary Surgeons in Edinburgh from November 25th to 29th, the following candidates have been awarded the Diploma in Veterinary State Medicine: G. J. Christie, David Evans, J. S. Paterson.

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VETERINARY INSPECTION IN GLOUCESTERSHIRE

In recommending to the Gloucestershire County Council the appointment of a Chief Veterinary Officer (the recommendation was accepted and the appointment advertised in *The Veterinary Record*), the Diseases of Animals Sub-committee stated that as soon as the new officer took office the mode in which the veterinary inspection of the county should be carried on should be considered, and in particular to what extent, if any, the assistance of part-time veterinary inspectors should be retained.

Submitting the resolution, Mr. Gilbert M. Ilquham remarked that Gloucestershire was a pioneer county in the matter of the inspection of dairy herds, and they had carried on until now with part-time veterinary officers, and were grateful for the assistance they had received from those officers at a time when neither Government nor public opinion took the interest in those matters that they did to-day.

Several things would have to be considered, including full-time assistants, and whether they would allow the inspection of markets to remain for a time in the hands of part-time officers.

The matter had now passed beyond the initial stage, and in other counties there was wide divergence of opinion in the way they thought they had to run that particular business.

He did not know himself whether they ought to have three or four assistant officers, but immediately they got a whole-time inspector no time would be lost in proceeding with the scheme and reporting to the Council.

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WORK OF THE WHOLE-TIME STAFF IN ESSEX

At a recent meeting of the Diseases of Animals Sub-Committee of the Essex Agricultural Committee the County Veterinary Officer, Mr. F. W. Medlock, said the newly-appointed whole-time veterinary officers were very keen on their work, which they were doing very thoroughly and economically. They were proving popular with the farmers they visited.

It was reported that during the September quarter one case of anthrax was confirmed against four during the previous quarter, and 12 of swine fever, against six. It was gratifying to know that no confirmed outbreaks of sheep scab occurred, compared with three confirmed in the previous quarter, and that so far the double-dipping order, which was imposed on flock owners last June, had been justified.

Tuberculosis was found on 239 farms, compared with 246 in the June quarter, and altogether 265 animals were slaughtered against 267.

The number of animals reported by stock owners was 194, of which the district veterinary officer confirmed 158 cases of tuberculosis. Routine inspection revealed 107 cases. The compensation for animals slaughtered amounted to £1,501 19s. 6d., of which £1,126 9s. 7d. would be refunded by the Ministry. Salvage received amounted to £66 5s., giving a net cost of £309 4s. 11d.

During the three months under review a total of 1,310 herds had been examined in accordance with the scheme for the periodical clinical examination of all milk-producing herds in the county. The number of cows found to be suffering from various diseases was 342, against 345 in the previous quarter.

The sale of milk from these animals for human consumption had been restricted. In a large percentage of cases the condition of the animals was of a temporary character, and they would re-enter the herd on recovery. If they appeared to be incurable, advice was given to stock owners as to their disposal.

Up to the end of September 611 herds, comprising 20,055 cows and heifers, of which 16,848 were in milk, had been examined by the district veterinary officers with a view to licensing these as "Grade A" herds. Diseased cows to the number of 538 had been removed from the herds in accordance with the requirements of the above Order; the issue of a licence in each case had been recommended, with the exception of two where the herds were not up to the required standard. The total number of licences issued up to September 30th was 485.

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TOTALISATOR PROFITS AND THE CLAIMS OF VETERINARY SCIENCE

In the course of his speech as the guest of honour at the Gimcrack Dinner at York, Lord Milton, who won the Gimcrack Stakes this year, expressed a hope that when the profit on the totalisator is being divided the claims of veterinary science will not be forgotten. He said that the Government for some years past had provided large sums for the well-being of cattle, sheep, pigs, etc., but no one seemed to have done anything about the horse.

Sir Clement Hindley, the Chairman of the Racecourse Betting Control Board, who proposed the toast of "The Jockey Club," announced that a substantial contribution would be made at the close of the year from the totalisator towards the improvement of horse racing. It was hoped to have a turnover of over £6,000,000 this year, as compared with just over £5,000,000 last year.

The grants, he said, to racecourses made early this year as the result of the 1934 work amounted to £7,500, and he asked that that figure should be treated more as a token than as a sample of what they could expect to do in the future. They had already promised to renew their grant of £5,000 to the Hunters' Improvement and National Light Horse Breeding Society in 1936. Sir Clement added that, in regard to Lord Milton's suggestion of helping veterinary work, they were now exploring the possibilities and, after consulting the Ministry of Agriculture, they had had a discussion with the Agricultural Research Council on the subject.

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FAILURE TO REPORT SUSPECTED FOOT-AND-MOUTH DISEASE

A fine of £35 with five guineas costs was imposed by Henley-in-Arden magistrates on Alfred Bird, aged 60, a farmer, of The Leasowes Farm, Tanworth-in-Arden, for having in his possession an animal suspected to be suffering from foot-and-mouth disease and not giving notice to a police constable with all practicable speed.

Mr. G. R. Johnstone prosecuted for the Ministry of Agriculture, and Mr. D. L. Finnemore appeared for the defendant, who pleaded not guilty.

Mr. Johnstone said that eight cows and five calves which the defendant had brought from Newport, Mon., were delivered to the farm, but on that day there was an outbreak of foot-and-mouth disease at Newport.

Later a Glamorganshire farmer who had also bought cattle at the same sale at Newport reported foot-and-mouth disease.

A preliminary notice isolating the defendant's farm was served on him, and he then said he had noticed nothing wrong with the cattle. However, Inspector Sheffield certified foot-and-mouth disease.

Mr. Johnstone said nearly £2,000 had been paid out for compensation for animals slaughtered, the bulk of it to Mr. Bird.

Inspector W. L. Sheffield, replying to Mr. Finnemore, said he did not know that the day before Mr. Bird bought the cattle they were examined and passed as correct.

In the witness-box Bird said he had never seen a case of foot-and-mouth disease and he did not recognise the symptoms.

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BRITISH FUR-BREEDERS' ASSOCIATION SHOW

Great success attended the annual championship show of the above Association, recently held at the London Zoological Gardens. The exhibition included all the important fur bearers that are bred in captivity except the silver fox for which there is a special society and exhibition.

"The farming of these animals, avoiding as it does the trapping and possibly the extermination of wild animals, is an industry which has the sympathy of most naturalists," says the *Times*, "and both the Zoological Society and the Society for the Preservation of Empire Fauna presented challenge trophies for the best fur bearers exhibited.

"The silver fox is said to be a colour mutation from the Canadian red fox. Blue foxes are descended from the Arctic foxes, the domestic variety retaining the slaty-blue summer coat throughout the year instead of changing to white in the winter as do the wild Arctic foxes. Cross foxes, like silver foxes, appear to have originated from the red fox; their name, being derived from the more or less distinct black cross on the shoulders, does not indicate mixed ancestry.

"The nutria, known also to breeders as the South American beaver, is the familiar coypu. The thick under-fur of this animal, which in life is concealed by long coarse hair, makes a beautiful pelt for useful rather than fashionable furs, and since coypus breed freely in captivity and cost next to nothing to keep, their farming appears to be a profitable industry.

"The challenge trophy presented by the Society for the Preservation of Empire Fauna was awarded to a coypu exhibited by the Avon Fur Farms. That presented by the Zoological Society was won by a mink shown by the Coombe Banks Mink Farm of Sussex.

"Viewed merely as a profitable hobby the rearing of fitch—polecats—would appear to offer the greatest possibilities. As their breeding quarters need be little more than elaborate ferret hutches, it is practical on a back-garden scale,

and it has been suggested as a profitable side line to poultry farmers who would be able to utilise the waste products of their business as food for the fitch."

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CHARLATANISM

In the course of a vigorous leading article under the above heading, the *Lancet* of November 23rd, quotes Wasserberg's definition of a charlatan or quack as "a person who engages in the treatment of the sick without possessing the requisite State authorisation for the purpose" and asserts categorically that quackery is undoubtedly flourishing and is steadily increasing in some European countries.

"Most countries prohibit quackery by law, but England and Germany are notable exceptions. In England toleration of quackery is ancient and traditional; in Germany, it is comparatively recent, and the legalisation of quackery was actually supported in 1870 by Virchow, Langenbeck, and other men of liberal ideas who argued that 'the State was not entitled to grant the prerogative of treatment to any one class or to limit the citizen's freedom to seek advice and help where he chose.' As a political gesture, the monopoly of the medical profession to treat the sick was abolished in France and Russia during the revolutions of 1792 and 1922 respectively. In both cases, however, it was speedily restored, for it was found to safeguard the interests of the State rather than those merely of the medical profession. Latterly there has been a steady curtailment of the quack's legal rights both in England and Germany. It must be admitted that whether quackery is legally accepted or not in any given country does not seem to influence the number of quacks practising in that country. They flourish, for example, just as much in France, where quackery is illegal, as in England, where it is not. Moreover quacks, like doctors, are found in proportionately greater numbers in towns than in rural areas, whence it follows that quackery does not in any measure depend for its existence on a scarcity of doctors. An inquiry concerning 1,301 quacks in Berlin brought to light some interesting facts. It was found that a considerable proportion of them had had no more than an elementary school education. Nearly three-quarters of them were over 40 years old, an observation suggesting that they had probably tried some other career first. The men outnumbered the women in the ratio of about two to one. Many of these charlatans of both sexes were drawn from the auxiliary medical services; for which, says Dr. Wasserberg, the medical profession is to be blamed, in too lightly entrusting such persons with responsible therapeutic tasks and so giving them undue confidence in their ability to treat the sick. Post-war unemployment must also have encouraged many to take up quackery as a means of livelihood, but although the desire to make money may be the strongest, it is not the only incentive to quackery as a career. Other strong motives are a desire to rise in the social scale, or a fanatical faith in some system of healing leading to the founding of new cults. Nevertheless the financial allurements must rank first. It is estimated that, in England alone, the money spent in fees to quacks would endow 40,000 hospital beds. Quackery is undoubtedly 'big business,' and the quack knows how to sell his wares. Minor licence holders in the United States are taught salesmanship in their training curriculum, and the power of the press is recognised and used to good purpose. There are 150 quack periodicals in Germany alone.

"It might be presumed that the quack's clientele is largely derived from the ignorant and illiterate, but in fact the reverse is true. Most of those who seek advice from quacks belong to the educated classes. It may therefore be interesting to inquire into why such persons go to the quack rather than to the doctor. The reasons are many, but some are obviously more important than others. *Facile princeps*, perhaps, is lack of therapeutic satisfaction. The intelligent layman often will not, or cannot, reconcile himself to the fact that he may be suffering from an incurable disease. No matter how many 'orthodox' doctors he may have consulted, he will not accept the inevitable. Something, he feels, must be done about it, and so he turns to the quack. Whether or no he benefits thereby does not ultimately matter so long as the hope of recovery is kept alive. To such a patient anything is preferable to the cautious and reasonable pessimism of the honest doctor. Another important factor leading to disharmony between patient and doctor may well be the impersonal and objective method of approach which is bred of a modern scientific training. The 'test-tube' doctor may lack that psychological perception which would teach him constantly to realise and remember that patients think of disease in terms of symptoms. To the patient, a 'serious' disease is one which makes him feel ill or cramps his activities. Whereas the doctor is apt to dismiss lightly and treat casually minor ailments which may, subjectively speaking, be anything but trivial, the quack is unlikely to make this mistake. His very lack of pathological knowledge compels him to think and treat symptomatically, and the fact that he and his patient both talk the language of popular medicine makes for mutual sympathy. And what of the therapeutic successes of the charlatan? These are often more apparent than real. 'Cures' are frequently claimed for diseases diagnosed only by the quack himself and, in reality, non-existent. Transient improvement in spontaneously remittent diseases is also hailed as cure. In some cases of self-curing disease the quack usurps the credit which rightly belongs to the healing power of nature, but it is among the functional disorders and the *malades imaginaires* that the quack is really at his best. Few such patients can remain completely inpervious to his compelling and irresponsible optimism.

"Finally, who is to blame for the continued existence of the charlatan? It would probably be just to reply, the doctor rather than the patient. We may accuse the sick layman of a taste for magic, of drawing false conclusions, and of a *post-hoc-propter-hoc* habit of mind; but the fact remains, when all is said, that if our therapeutics and methods of handling the patient were better, the *raison d'être* for the quack would disappear from civilisation and, with it, the quack himself."

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HISTORY OF MEDICAL EDUCATION

In his address at the opening of the 142nd session of the General Council for Medical Education and Registration, on November 26th, Sir Norman Walker, the President, stated that the Lord President of the Council, now the Prime Minister, had approved in principle the preparation of an amending Bill to deal with the election

of direct representatives, the recognition of diplomas in public health granted by bodies outside the United Kingdom, and the publication of the British Pharmacopœia. An addendum to the British Pharmacopœia 1932 would, it was anticipated, be published in 1936.

The President devoted the major portion of his address to a survey of the history of medical education and legislation in the United Kingdom, and the part played by the Council in that history. During the early years of the nineteenth century, many efforts had been made to secure better regulation of the practice of medicine, for it had become evident that something different from the limited rights and privileges conferred by Royal Charter or by existing Acts of Parliament on universities and medical corporations was required.

The Medical Act, 1858, resulted in the establishment of a council with rather vague and undefined powers, composed of one member from each of the chartered bodies and six members nominated by the Crown, with the Privy Council in the background.

The preamble to the 1858 Act, though clear enough about its objects, left the Council to define "qualified practitioner." The Council first settled who was to come on to the Register by virtue of his existing qualifications or appointments. It next made arrangements for the production of the British Pharmacopœia, asked all the teaching bodies for a statement of their requirements from candidates for qualification, and elected a committee on education. It laid down then that four years must be spent in professional studies; that the licensing bodies would do well to encourage students to study natural science before their strictly medical course; and that both the first and the final examinations should be partly written, partly oral, and, so far as practicable, clinical.

The 1886 Act, though perhaps not perfect from the medical point of view, established several new principles. No one could to-day be registered who had not passed a qualifying examination in medicine, surgery, and midwifery, and the system of approximately decennial inspections which it introduced had been of equal value to the Council and to the public.

In almost all other countries nowadays medical education was controlled more or less directly by the State. In the General Medical Council every licensing body had a representative to contribute his share to every change in medical education. The Council's duty was to ensure "that the standard required from candidates at the qualifying examinations shall be such as sufficiently to guarantee the possession of the knowledge and skill requisite for the efficient practice of medicine, surgery, and midwifery."

The elasticity of the system was one of its strongest characteristics. The Council placed efficiency before uniformity, and had learned by the experience of 77 years that sound reason was more effective than compulsion.

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THE ADRENAL CORTEX AND INFECTIONS

"That some close connection exists between the endocrine system and the mechanisms for combating infections is more a matter of conviction than of demonstrated fact," observes the *British Medical Journal*. "Experimentation in this field is very difficult. It has long been known that general infections lead to very pronounced changes in the cortex of the suprarenal glands. Outstanding among these changes are diminution in size and quantity of the lipoid droplets: later the cells vacuolate and degenerate; and subsequently may be completely destroyed, the nucleus breaking down, and local circulatory disturbance may lead to infarction. How far the depressed muscular state during and after infections may be correlated with changes of this sort is not yet firmly established, but, having regard to the points of contact with the symptoms of Addison's disease, it seems not improbable that infections lead to a diminished secretion of the cortical hormone. In a recent paper S. Thaddea* refers to the results of experiments with adrenalectomised animals which were exposed to various toxic agents. Such animals show in general a lowered resistance to the toxins of diphtheria and tetanus, and to staphylococci, streptococci, and *B. typhosus*. In the intact animal diphtheria toxin changes both the morphology and the chemical constitution of the adrenal cortex, a greater or less disappearance of cholesterol according to the degree of intoxication. Even the natural resistance of the rat to *Bartonella muris rattis* is much diminished by adrenalectomy, and so is tolerance to histamine, morphine, and other chemical poisons. Experimental intoxication of the guinea-pig with diphtheria toxin leads to some striking changes in carbohydrate metabolism—creatine appears in the urine, probably as a result of exhaustion of glycogen supplies in both liver and muscles; and lactic acid is diminished in the muscles both at rest and after rigor has set in. These serious changes can be corrected by treatment with the hormone of the suprarenal cortex, if combined with rather large doses of ascorbic acid (vitamin C). Further, guinea-pigs treated with 0·1 c.cm. per day of a broth culture of *B. diphtheriæ* all die in about 50 hours; if, however, simultaneously they receive injections of cortical hormone and ascorbic acid, the pathological findings obtained in the controls (hæmorrhages and necrosis of suprarenal cortex) do not appear, and the animals survive. This effect is not obtained if previously the reticulo-endothelial system has been injured by the intravenous injection of electrocollargol, thus showing that the therapeutic success was of an unspecific nature. Nevertheless, as pointed out by Thaddea, these results give us an important lead in the therapeutics of infectious diseases. In a very close examination of a case of Addison's disease which, as a result of an attack of influenza, developed the signs and symptoms of an Addisonian crisis, the same author was able to show that to a very great extent energetic treatment with cortical hormone could re-establish the more or less satisfactory condition of the patient before the infection. Supported as it was by considerable chemical data, this work would indicate that in an acute infection there is either a great diminution in the residual power of secretion of the adrenal cortex in Addison's disease, or that, as in the case of diabetes, there is an inactivation of the secretion, thus leading to a greater hormonal requirement. The mechanism of action is obscure, but from the point of view of treatment of post-infective (particularly post-influenzal) asthenia it is well worth considering whether it may not be rational to utilise preparations of cortical hormone alone or in combination with considerable quantities of vitamin C."

* *Klin. Woch.*, September 7th, 1935.